VOLUME XXI SEPTEMBER 1928 NUMBER 9

Southern Medical Journal

Journal of the Southern Medical Association

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Entered as Second-Class Matter at the Post Office at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Dec. 20, 1921.

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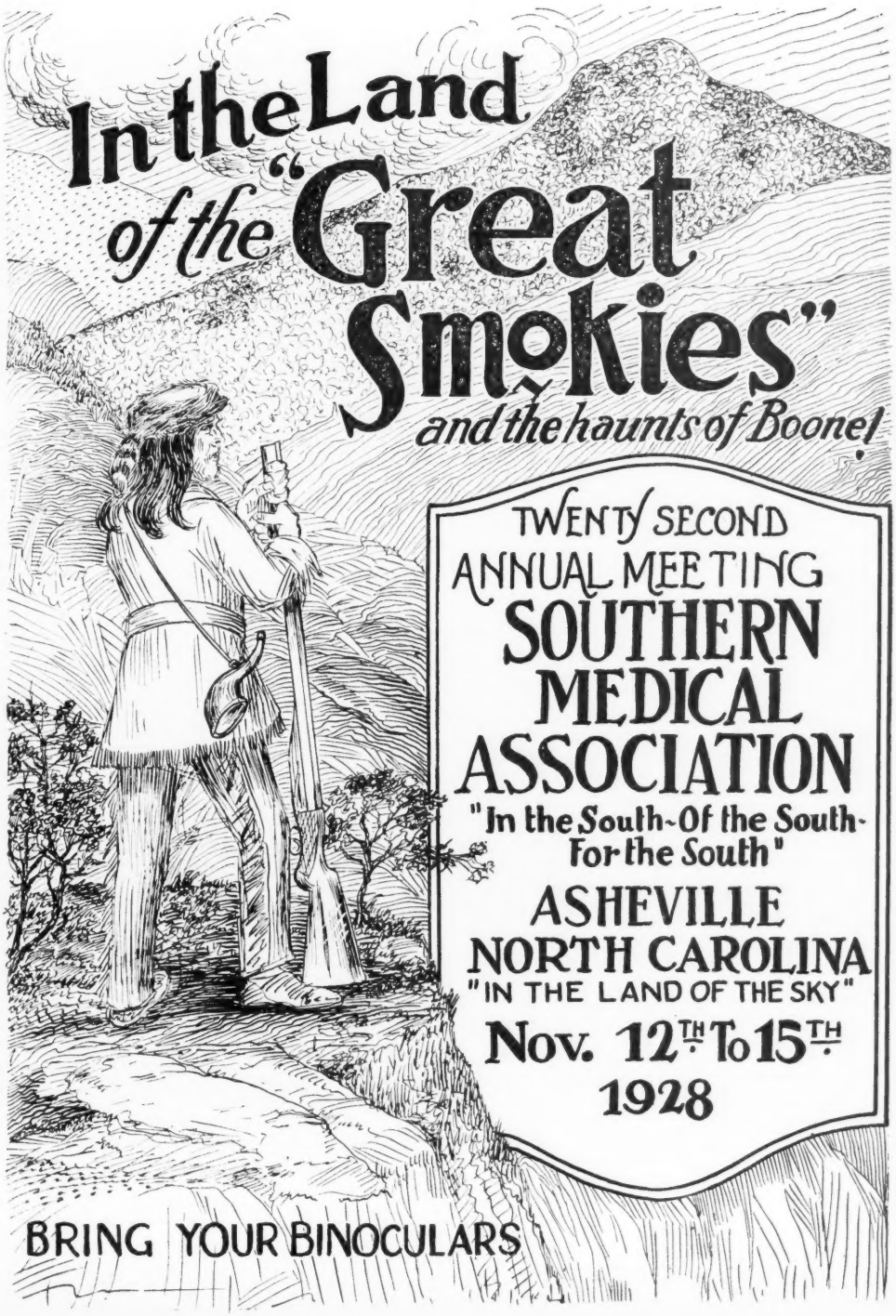
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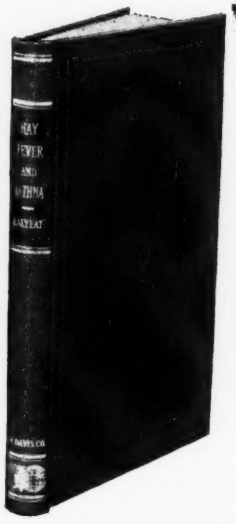

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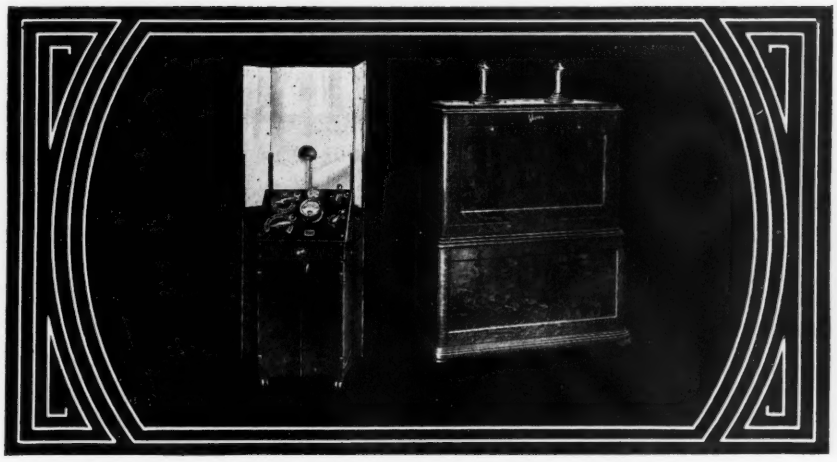

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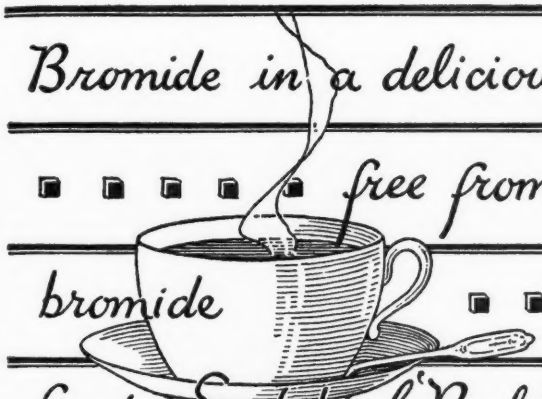

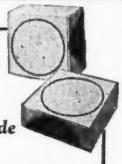

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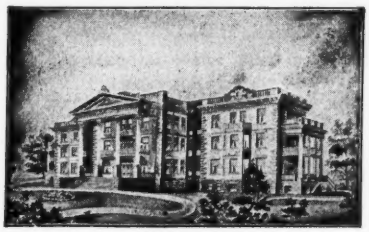

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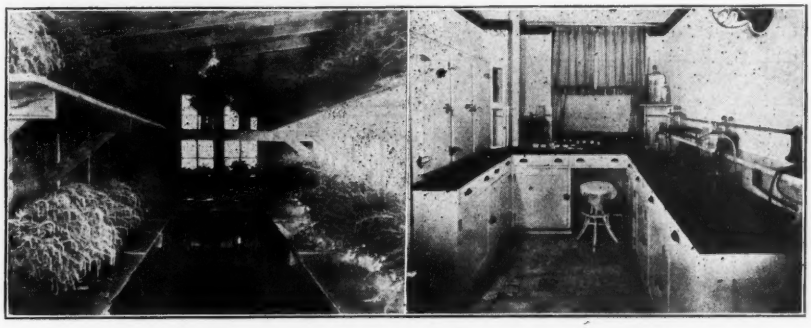

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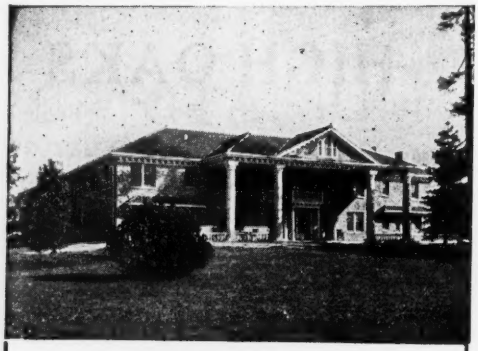

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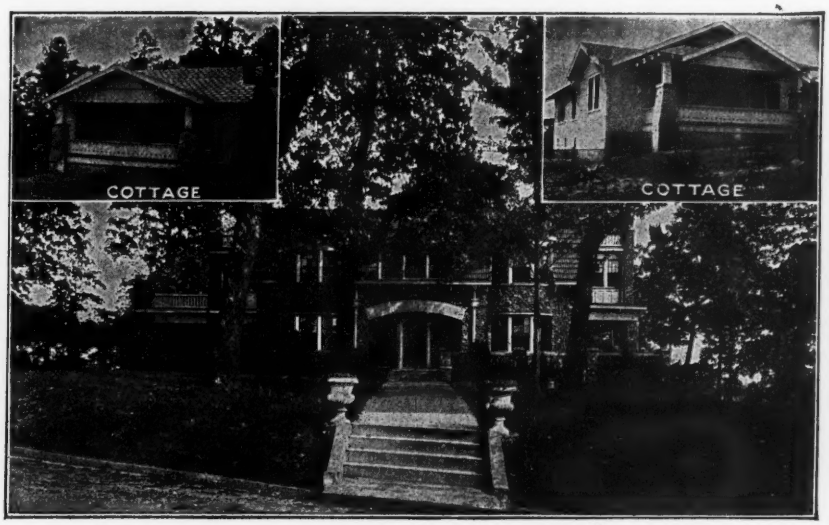

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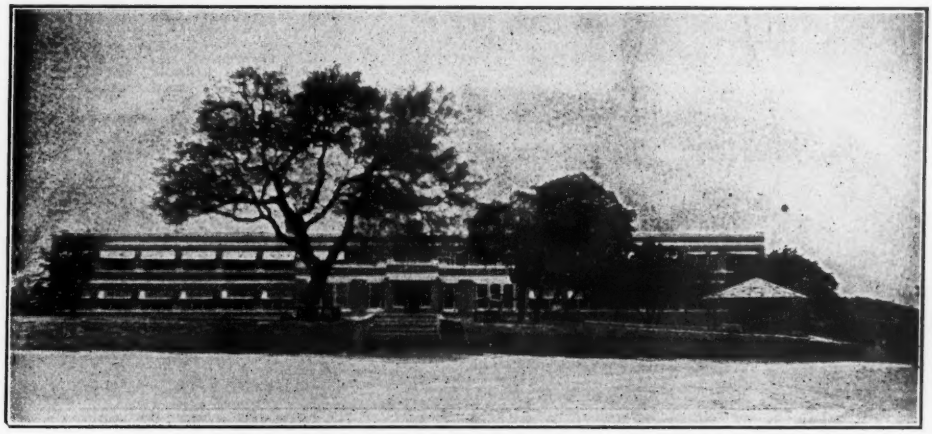

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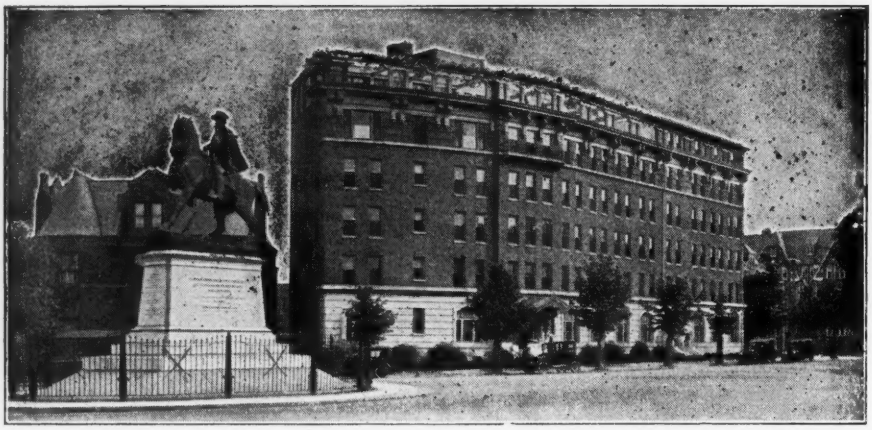

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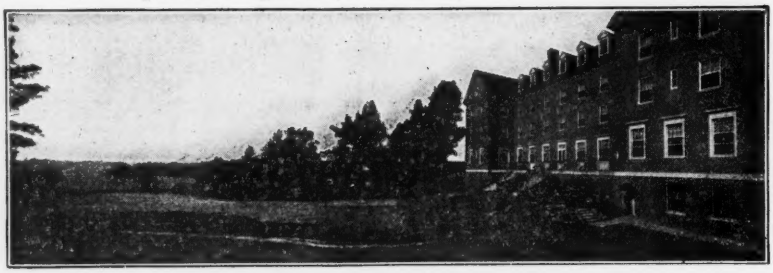

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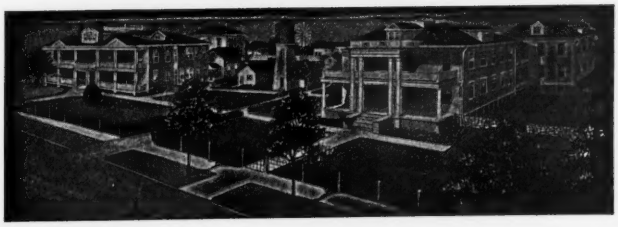

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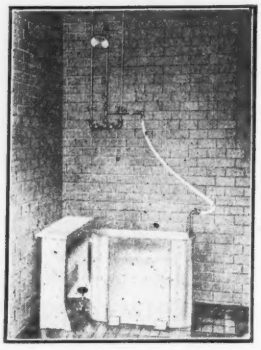

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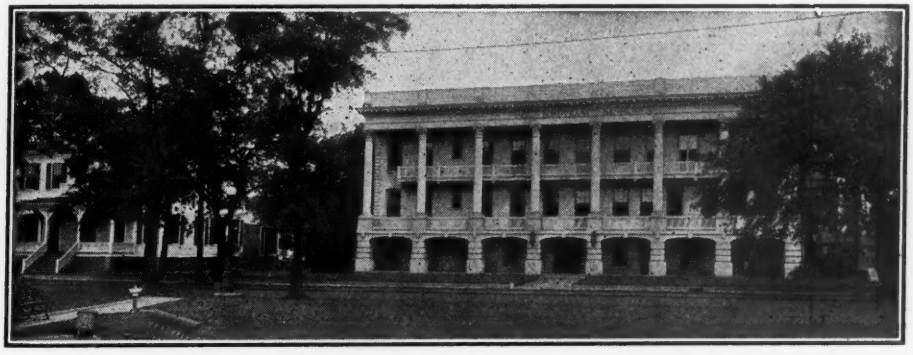

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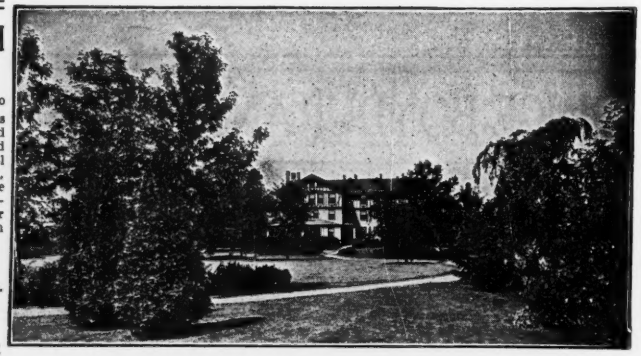

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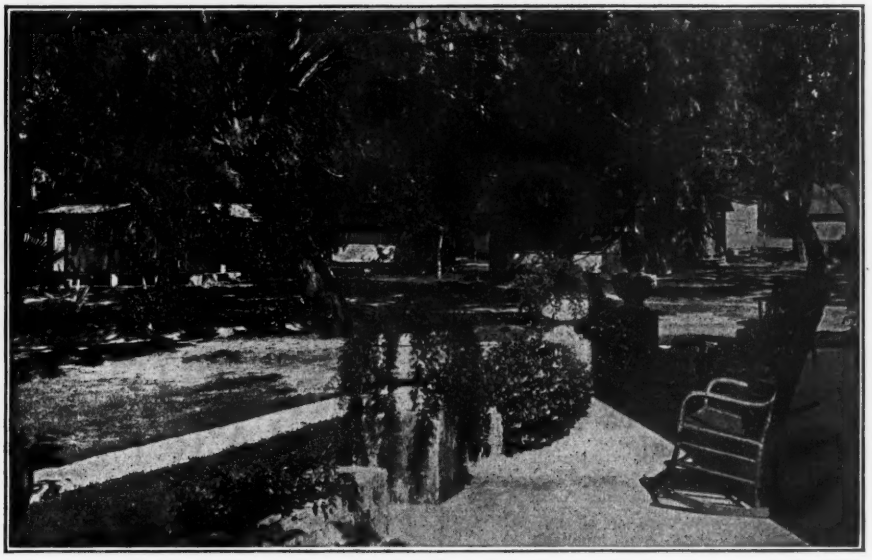

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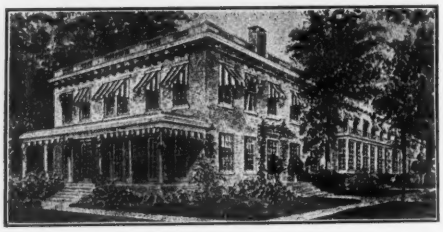

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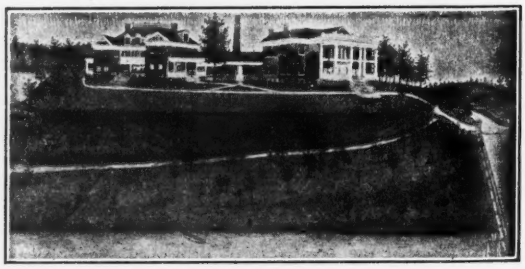

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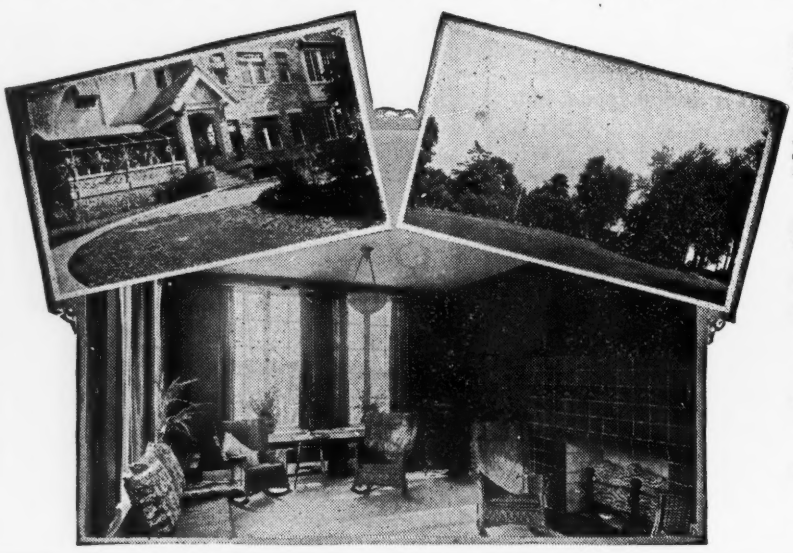

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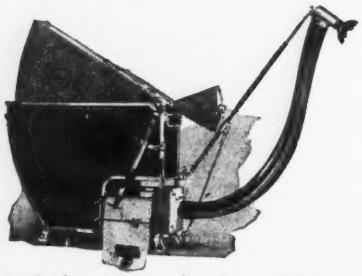

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Volume XXI SEPTEMBER 1928 Number 9

NEPHRITIS IN CHILDREN AND YOUNG ADULTS WITH ESPECIAL REFERENCE TO FOCAL GLOMERULO-NEPHRITIS*

By I. I. LEMANN, M.D.,
New Orleans, La.

The focal nephritis included by Volhard and Fahr in their classification of nephritides has not received much attention or discussion. McElroy, in his article in the Tice "Loose Leaf Practice of Medicine," and Elwyn, in his recent monograph, have followed Volhard and Fahr in adopting it and have set forth their ideas as to its pathogenesis and pathological histology. I have seen a number of cases in which it seems to me that the postulates laid down by these authors for the recognition of this form of nephritis have been met. Certainly, the symptoms and course of the disease in the patients whose illness I shall relate can reasonably be explained upon the basis of the pathological condition assumed by these authorities. They make a distinction between a diffuse glomerulo-nephritis and a focal glomerulo-nephritis. In the former all, or nearly all of the parenchyma is involved, few, if any, of the glomeruli remaining untouched; whereas in the latter only a relatively few glomeruli are diseased. Christian in his article in "Oxford Medicine" mentions cursorily that glomerulo-nephritis may be diffuse or patchy. Apparently, therefore, the focal glomerulo-nephritis of Volhard and Fahr differs only in degree from the generally accepted conception of a diffuse glomerulo-nephritis. This distinction as to degree and extent appears, however, to assume a greater importance if one may believe that only a relatively unimportant number of glomeruli is involved. Such a process might, therefore, present a very different clinical picture and deserve to be set down as a distinct entity. It must be conceded that the thesis is somewhat difficult of proof since necessarily the mortality is practically nil and one may expect to see the pathological condition of a focal glomerulo-nephritis only when a patient has died suddenly from a cause entirely unrelated to the nephritis. When death occurs much later in life, it would be difficult to distinguish the original focal process from a superimposed one due to a later inflammatory or degenerative cause. The distinguishing marks of a focal glomerulo-nephritis which set it off from a diffuse one are said to be the absence of edema, the lack of retention of waste products in the blood stream, the preservation of the phenolsulphonephthalein excretion function and of the ability of the kidney to vary the specific gravity of the urine and finally, the absence of a rise in the blood pressure. It may be suggested that these differences correspond to the two forms of glomerulo-nephritis described by McCrae in Osler's "Modern Medicine," namely the frank form with edema and the insidious form without edema (and probably without the other manifestations of an acute nephritis other than the urinary findings). The phenomena of the disease must depend to some degree upon the extent of the process. They would be negligible when very few of the glomeruli were involved; more severe when the process was more extensive. The clinical picture, therefore, tends on the latter side to merge with that of acute glomerulo-nephritis. It is to the former type that I wish to address my remarks. An involvement of even one glomerulus or a small group of glomeruli, sharp and sudden, may cause a hemorrhage into the capsule and the appearance of more or less blood in the urine. This is illustrated by the following:

Case 1—Mrs. Alice F., a white woman (No. 975), age 26, mother of two children, had in February, 1917, an attack of measles. The rash disappeared on February 25. On February 26 she noticed blood trickling down the thighs after urination. It was soon proven that this was not due to menstruation, that it definitely came from the bladder and not from the vagina. On March 29 an examination of the urinary tract

*Read in Section on Medicine, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

through a cystoscope was made by Dr. Joseph Hume. He reported:

"There is a redness of the trigone. Urine from the right kidney was clear without albumen while that of the left kidney was hazy, pinkish and showed a trace of albumen and many blood cells. Phenolsulphonephthalein 1 c. c. was injected intramuscularly; the dye appeared almost simultaneously in 9 minutes from both sides; the urine was collected from each side for fifteen minutes during which period the right side excreted 3.5 per cent and the left side 35 per cent, while for the remainder of the two hour period the percentage excreted was 48, making a total excretion for the two hours of 55 per cent." She did not menstruate until March 21. The urine showed blood microscopically up to May, 1917. During the whole illness casts were only rarely found and no albumen was found. Casts were observed occasionally in the early part of 1918. Since 1918 no abnormalities have been found in the urine except on one occasion in April, 1927, when a very few hyaline casts were seen. There was no rise in the blood pressure in her illness and no edema. In March, 1921, the blood pressure was 125/80. She has continued in excellent health. At this time (November, 1927), 10.5 years after the occurrence of the bloody urine physical examination of her is negative. Of phenolsulphonephthalein given intravenously, 65 per cent is excreted in two hours. The urine is negative. The total non-protein nitrogen is 33 mg. per 100 c. c. of blood.

Following immediately upon an infectious disease, measles, there occurred bleeding from the urinary tract, probably from the left kidney without apparently any other evidence of a nephritis. I assume that the hemorrhage was caused in a glomerulus or a group of glomeruli and that no other portion of the kidney was involved.

The focal glomerulo-nephritis may be subacute or even chronic. Its cause may lie not in an infectious disease but in some distant focus of infection, such as the tonsils.

Case 2.—John K. S., a white boy (No. 1248), age 11, was first seen by me in September, 1920. In August, 1919, his mother had noticed that the boy's face was swollen. About a month later the urine was examined when pus, albumen and casts were found. The swelling of the face disappeared almost immediately. The urine was said to be normal in October. Some swelling of the face appeared again about January 15, 1920, and the urine was examined then, after an interval of several months, and showed pus, albumen and casts. Each time the swelling was preceded by a head cold. The patient was kept in bed for nine weeks from February 5 to April 10. The urine improved constantly. In April it no longer showed albumen or casts and only an occasional red cell. The blood pressure was never elevated, usually 100/80. In November, 1920, a two hour test of the urine showed specific gravity varying from 1.010 to 1.022, few hyaline casts and traces of albumen. The boy has been observed for the succeeding seven years. In December, 1920, the urine still showed a few hyaline casts but otherwise it was normal. The blood pressure was 110/84. In March, 1921, the urine showed a very faint trace of albumen but nothing else abnormal. Sixty per cent of the phenolsulphonephthalein given intravenously was excreated in two hours. In 1922 the urine was normal. In October, 1924, a few hyaline casts were found and a small amount of pus. The blood pressure was 120/90. In May, 1926, he was a handsome fellow, height 6 feet 1.5 inches, weight 159 pounds. He had engaged vigorously in baseball and football. The heart was not enlarged, the blood pressure was 112/70 and the urine was normal. In this patient the only focus of infection found was that suggested by large tonsils. Operation was refused. It seems probable that there was some relation between the head cold, the enlarged tonsils and the focal nephritis.

Case 3.—John H., a white boy (No. 1869), age 13, was seen before 1922 for various ailments, coughs, poor appetite and easy fatigue. The urine in December, 1922, and January, 1923, showed a very faint trace of albumen, a small amount of pus and occasional hyaline casts, the specific gravity varying from 1.008 to 1.022. The boy was somewhat pale, otherwise the physical examination was negative. The blood showed no anemia. The tonsils were reported by Dr. A. I. Weil:

"The tonsils are not enlarged. There is only moderate evidence of disease. While they are not what I would call perfectly healthy tonsils, I should not recommend their removal unless you can find no other cause for kidney condition and unless you think it advisable."

In December, 1923, there had been an increase in the amount of albumen, hyaline and granular casts. The boy still had a cough, looked pale and fatigued easily. The blood pressure was 96/55.

The urinary tract was investigated by Dr. Joseph Hume who reported:

"A little pus from the prostate, urine from both ureters showed albumen and casts, phenolsulphonephthalein tests was 70 per cent for two hours."

Tonsillectomy was finally done in February, 1924, by Dr. Weil under ethylene gas anesthetic and the tonsils were found much diseased. In March, 1924, the urine showed both hyaline and granular casts. By May the boy had increased in weight from 107 to 116 pounds. In June, 1924, the urine showed many red blood cells and much pus. He was then sent back to Dr. Joseph Hume who reported that the prostate was slightly hard and the secretion contained much pus. He cystoscoped the patient, went into both ureters and found nothing abnormal. The urine cleared up promptly under prostatic massage and about the end of July it was perfectly clear, containing no pus or organism but still a trace of albumen. Under this treatment which was kept up from June, 1924, to March, 1927, the patient improved greatly. His weight went up to 125 pounds. The blood pressure was never at any time elevated. In March, 1925, the blood pressure was 120/70, the heart not enlarged. In September, 1926, the urine still showed a faint trace of albumen, and a large amount of pus. The blood pressure was 90/45. In November, 1926, Dr. Pratt reported that the urine showed a faint trace of albumen, hyaline casts, and an occasional red blood cell. The phenolsulphonephthalein excretion was 70 per cent in two hours and the blood pressure was 110/65.

While a glomerulo-nephritis due to infection probably both in the tonsils and prostate is to be assumed, it does not seem probable that it was extensive. The kidney function was never

at any time seriously impaired. The blood pressure was never elevated.

Nephritis of this type may stimulate renal or urethral calculus. This is illustrated by the following:

Case 4.—F. A. L., a white man (No. 2840), age 23, was seen first in March, 1926. On March 2 he arose with pain in the abdomen across from one side to the other at the level of the umbilicus. This pain was accompanied by a desire to pass flatus which, however, he could not accomplish. The pain lasted fifteen minutes. Later he had a pain in the right side of the abdomen which was made worse by rising after leaning over. Two hours after the onset of the first pain the bowels moved normally. There was no nausea nor vomiting. Dr. Maes, who saw him that night, found no evidence of intra-abdominal trouble.

The next day Dr. Maes saw him in the office and gave Dr. Johns a specimen of urine voided at 3:30 P. M. The examination of this specimen showed: specific gravity 1.031, acid, albumen 1.8 per cent, indican—a few hyaline and fine granular casts, epithelial cells, numerous erythrocytes, and no pus. Dr. Johns reported the blood, as follows: hemoglobin 87 per cent, red blood cells 4,565,000, leucocytes 9,250, small lymphocytes 23, large lymphocytes 3, polymorphonuclears 72, eosinophils 2. For six months previously he had had a pain in the left side of the back two or three times a week. These pains lasted from a few minutes to all day. Once he thought that he had hurt his back. The pains were never referred to the genitalia. Sometimes he had had a little burning with micturition during the preceding two or three months. Micturition: none at night and four or five times by day. The appetite had been very bad for two or three years. Two years before he had weighed 148 pounds, fully clothed; in the summer of 1925 he weighed 129 pounds, stripped.

He had had measles, typhoid, and malaria fifteen years before, no venereal disease. He smoked twenty cigarettes a day, but took no alcohol. The physical examination showed a tall, sallow young man, height 5 feet 11 inches, weight 134 pounds, with slightly enlarged tonsils. The blood pressure was 115/75. The heart and lungs were normal. The kidneys were not felt. The abdomen was not tender. My impression was that he had an unilateral affection of the urinary tract. He was sent to Dr. P. J. Kahle who reported:

"The prostate is slightly enlarged *per rectum*, the bladder negative on cystoscopy. Urine from the right kidney is fairly cloudy, albumen is present, there are many leucocytes, and red blood cells, the urine from the left kidney is fairly cloudy, albumen is present, there are bloody, finely granular casts, and an occasional leucocyte. Phenolsulphonephthalein appeared on the right side in five minutes; the output in fifteen minutes was 14 per cent; it appeared on the left side in four minutes; output in fifteen minutes 15 per cent. Pyelograms and uretergrams showed no abnormality." Dr. Kahle commented that he saw no reason for the hematuria except his nephritis. "I am of the opinion, in view of the apparently normal 'phthalein output, that he has a right glomerulo-nephritis which is responsible for this. Although there is some involvement of the tubules, this is evidently not sufficient to cause a diminution in the output of the dye."

The patient was treated by prostatic massages throughout 1926. There continued to be a faint trace of albumen and pus in the urine with occasionally hyaline casts. Dr. Kahle continued to find pus in the prostatic secretion. The blood pressure remained always low; in September, 1926, it was 105/50; in December, 1926, 100/70. The weight had gone from 134 to 140 pounds, and his general health had improved correspondingly. In May, 1927, tonsillectomy was done by Dr. C. J. Lanfried under ether anesthesia. His general appearance has improved considerably since then and his general vigor has improved. The urine still continues to show many leucocytes but no albumen or casts. The blood pressure in July, 1927, was 120/65.

Focal glomerulo-nephritis was due probably to chronic tonsillitis. Bleeding with consequent clot formation was probably the cause of the lumbar pain which lead to the suspicion that a calculus was passing.

I have seen in a little girl aged 8 a nephritis of this mild type in whom we were unable to find any probable focus of infection except a pyelitis.

In order to emphasize the features of this mild form of nephritis I set off in contrast the following history of a young woman with diffuse nephritis who was observed for a period of six years.

Case 5.—Mrs. Paul K., a white woman (No. 1375), age 20, was first seen in October, 1920. She had had fever and slight sore throat at the time that her sister had scarlet fever. In the patient's case the diagnosis of scarlet fever was said to have been dubious. The urine had not been examined earlier than 4½ years before 1920. At that time she was "run down" and had severe headaches. The blood pressure was said to have been 165 and the urine to show albumen. At the time that I first saw her the blood pressure was 160/130. The urine showed albumen and occasional leucocytes and there was fixation of the specific gravity below 1.010. The phenolsulphonephthalein excretion (intramuscularly) was 42.5 per cent for two hours. The total non-protein nitrogen of the blood was 33.9 mgs. per 100 c. c. By January, 1922, the phenolsulphonephthalein excretion had diminished to 30 per cent in two hours. From 1922 to 1924, her condition remained unchanged except for a slowly developing anemia. Her blood at that time showed 3,790,000 red blood cells, 65 per cent hemoglobin. The urine showed a fixation of the specific gravity, hyaline, finely granular casts and a trace of albumen. The phenolsulphonephthalein excretion remained 30-35 per cent in two hours. The blood pressure was 165/100. In the early part of 1925 extensive albuminuric retinitis developed and in April of that year the blood pressure was 220/140. The total non-protein nitrogen of the blood had risen to 66 mgs. per 100 c. c. and the phenolsulphonephthalein excretion had fallen to 20 per cent for two hours. In 1926, the phenolsulphonephthalein excretion had fallen still further to 10 per cent for two hours. The extent of the albuminuric retinitis had increased. The urine continued to show large amounts of pus, few red blood cells and a few hyaline casts. In July, 1926, the phenolsulphonephthalein excretion was for the first hour less than 5 per cent, for the second hour less than 5 per cent. The total non-protein nitrogen of the blood remained at 60 mgs. per 100 c. c. The

anemia had progressed so that she had 60 per cent hemoglobin, and 2,790,000 red blood cells. The blood pressure was 225/130. There was a systolic murmur in the fourth left intercostal space. In September, 1926, she died after having been in coma for eight days.

Comment.—Here we have a progressive impairment of the kidney function, whereas in the other cases no such impairment was observed. In this case, too, there was from the time she came under observation fixation of the specific gravity. The prognosis from the time I saw her in 1920 was distinctly unfavorable because of the elevation of the blood pressure.

CONCLUSION

This mild type of nephritis deserves recognition as a separate entity both because of the favorable prognosis and because of the distinctly different treatment it requires. There should be no narrowly limited diet. It suffices to forbid kidney irritants such as pepper, condiments and the like and, in order to play safe, a very moderate restriction of protein food. The cause, if a focal infection, should be removed or treated. The usual warning is given to avoid chilling, "catching cold" and fresh infection.

DISCUSSION (*Abstract*)

Dr. W. E. Nesbit, San Antonio, Texas.—This type of case equals or possibly outnumbers all of the cases of nephritis of the diffuse type and the nephroses put together.

Each group of nephritis is so uniform that the etiology of all may be considered together. The idea of bacterial origin is steadily gaining ground. There is scarcely an infectious disease in which at some time a nephritis has not been found. Streptococcus infection is especially associated with nephritis. The cause of every nephritis is almost without exception an infection of some sort; and the different forms and stages of nephritis have the same origin. The greater role is assigned to the streptococcus as a causative agent, but the pathogenesis is still obscure. The diffuse type is usually attributed to the streptococcus circulating in the blood stream which produces the characteristic lesions.

Another theory, and this would explain focal glomerular nephritis, is that the condition may have an embolic origin. This has been demonstrated in culture of the urine, and in some cases as I mentioned by blood culture also.

Dr. J. B. McElroy, Memphis, Tenn.—The question of focal nephritis has been a disputed one for a long time, some authorities taking the ground that there is no such thing. I think we can very well divide the focal nephritides into the chronic, diffuse, glomerular and the bacterial non-suppurative types, and, of course, the focal embolic type that usually occurs in *Streptococcus viridans* infections, as well as the interstitial nephritides. It has been demonstrated that these cases do actually occur, namely the bacterial non-suppurative, focal, glomerular nephritides and they can be very well isolated according to their clinical symptoms. The characteristic features probably are the absence of hypertension and cardio-vascular disease, sufficiency is not usually present but may be if the disease lasts long enough; and I think it is well that these cases should be called to your attention just for the reasons mentioned by Dr. Lemann. You will sometimes see a patient with tonsillitis who develops an albuminuria and hematuria. There is an absence of hypertension and cardiovascular changes, and you can very well assume that a focal nephritis is present carrying a very much more favorable prognosis than the other cases described, classified as the chronic diffuse glomerular type.

Dr. Lemann (closing).—I wish to emphasize the chronic nature of many of these cases. They run over periods of years and may continue even after the removal of the cause. It is very necessary to recognize the chronic and non-malignant nature of the disease. One often sees this particular group of patients maltreated because of overzealousness, by unnecessary restriction in the diet. We then find an increase in the anemia that may accompany the trouble, by this very unnecessary restriction both of the diet and of the activities of the patient.

A STUDY OF CERTAIN BLOOD TESTS FOR SYPHILIS*†

By EDMUND K. KLINE, DR. P.H.,
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The physician and laboratorian is constantly assailed by enthusiasts in speech and print who claim for some one test for syphilis that it is far superior to all others and, indeed, may be regarded as almost infallible. This laboratory has attempted to compare in an impartial manner the results obtained by several different methods of testing blood for syphilis including both complement-fixation, and precipitin tests, and a resume of that work is here presented.

Material and Method of Investigation.—The bloods used were taken at random from the 30,000 annually submitted to this laboratory. Each blood was tested by two or more methods and finally on a selected series the results were checked back to the clinical evidence by a careful canvass of the physicians who submitted them. We have compared with each other only tests which were run on the same day, and in the case of complement-fixation tests with the same hemolytic system.

Complement-Fixation Tests.—All complement-

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*From the Bureau of Laboratories, Jefferson County Board of Health, Birmingham, Ala.

†Received for publication, May 11, 1928.

TABLE 1
AGREEMENT OF VARIOUS BLOOD TESTS FOR SYPHILIS

	Comparison of Method	Method	Number of bloods tested	Tests in Agreement: Number	Tests in Agreement: Per Cent
Series I	A. Standard Kolmer 0.1 c. c. sera	B. Standard Kolmer 0.05 c. c. sera	21,751	21,422	98.49
	A & B strongest reaction of Kolmer 0.1 & 0.05 sera	C. Cholesterolized 0.4%	19,170	17,157	89.50
Series II	Complement fixation tests	G. Kahn tests	6,618	5,921	89.47
	Interpretation of A. Standard Kolmer C. Cholesterolized 0.4% E. Plain alcoholic	H. Microscopic slide	6,618	5,860	88.55
	F. Kahn test	H. Microscopic slide	6,618	5,970	90.21
Series III	A. Standard Kolmer	D. Cholesterolized 0.1%	3,358	3,114	92.73
		E. Plain alcoholic	3,358	3,249	96.75
		G. Kahn test	3,358	3,009	89.61
		H. Microscopic slide	3,358	2,980	88.74
	B. Plain alcoholic	D. Cholesterolized 0.1%	3,358	3,217	95.80
		G. Kahn test	3,358	3,078	91.66
		H. Microscopic slide	3,358	3,051	90.86
	D. Cholesterolized 0.1%	G. Kahn test	3,358	3,053	90.92
		H. Microscopic slide	3,358	3,049	90.80
	G. Kahn test	H. Microscopic slide	3,358	3,191	95.03
	All tests in this series A.D.E.G.H. agreed		3,358	2,820	83.98
Series IV	A. Standard Kolmer Antigen to salt 0.1 c. c. sera	F. Standard Kolmer Salt to Antigen 0.1 c. c. sera	745	720	96.64

fixation tests are based on the same hemolytic system, a sheep corpuscle, guinea pig complement system balanced on the basis of a "full" unit of complement with the technic recommended by Kolmer;[1] a primary fixation of 16-18 hours at 7° C. (overnight ice box) followed by 10 minutes at 37.5° C. and a secondary incubation, after the addition of indicator reagents, of 1 full hour at 37.5° C. The variable elements in the tests were the antigens, and in one series the amount of the patient's serum. These variations gave us methods as follow:

(A) The standard Kolmer qualitative test with 0.1 c. c. patient's serum and standard Kolmer antigen in 10 antigenic unit doses.

(B) The standard Kolmer test with 0.05 c. c. patient's serum.*

(C) A test with cholesterolized (0.4 per cent) alcoholic extract of beef heart antigen in doses of 10 antigenic units and 0.1 c. c. patient's serum.

(D) A test with cholesterolized (0.1 per cent) alcoholic extract of beef heart prepared after the New York State Laboratory modification of the method of Neymann and Gager[2] and diluted after evaporation according to the method of Bordet.[3] The antigen is used in 10 unit doses with 0.1 c. c. patient's serum.

(E) A test with 20 antigenic units of a plain alcoholic extract of beef heart (dried muscle washed four times with ether and extracted with 95 per cent alcohol) and 0.1 c. c. patient's serum.

(F) A test exactly conforming to Kolmer's standard test (our A) except that the antigen was diluted by adding salt solution to the antigen instead of antigen to salt solution. This antigen was more turbid than that diluted by Kolmer's recommended method.[4]

Precipitin Tests.—(G) The standard three tube Kahn test.[5]

(H) The "immediate slide precipitin test" of Kline and Young.[6]

RESULTS

Our results were recorded in the usual method as negative to four-plus, and all results are considered in agreement that coincided or were only one reading removed from each other. The work is presented in four series as shown in our *Table* 1. *Series IV* is also presented in *Table* 2 to bring out the fact that such a slight difference as the method of diluting the antigen, by adding salt to antigen or antigen to salt, will have a decided effect in the sensitivity of the Kolmer reaction. In this connection it is necessary to state that the more turbid antigen (method F) had a much lower antigenic titer than the less turbid (method A) the ratio being about 1 to 2 1-3 and yet the former proved much more sensitive. The difference, therefore, must be one of specificity rather than sensitivity. All

*Kolmer stated before the American Society of Clinical Pathologists 1925: "I may say that the qualitative test should always be done with 0.1 and 0.05 c. c. of serum; occasionally the 0.1 c. c. dose yields a weaker or negative reaction with syphilitic serum whereas positive reactions occur with the 0.05 c. c. amount." Jour. Lab. and Clin. Med. 11:451, 1926.

TABLE 2
SERIES IV COMPARING METHOD OF DILUTING ANTIGEN IN STANDARD KOLMER TEST

Bloods tested	745	
Agreement	720	96.64%
Non-agreement	25	3.36%

A. KOLMER PREFERRED METHOD NON-TURBID—Antigen to Salt
F. TURBID—Salt to Antigen

	Neg.	+1	+2	+3	+4
Neg	580 77.85%	5 0.67%	6 0.81%	4 0.54%	9 1.21%
+1		4 0.54%	1 0.13%	1 0.13%	
+2			3 0.40%	2 0.27%	5 0.67%
+3					3 0.40%
+4					122 16.38%

tests in this series which were positive with either modification of Kolmer gave a strong four-plus reaction with cholesterinized antigen (method D).

In *Table* 3 we present those tests in our *Series III* which were out of step with the other tests run in that series, which included tests A-D-E-G-H. In compiling this table only tests of three- and four-plus were considered as positive. The bloods represented in this *Table* 3 are those we picked out for checking back to the clinical symptoms and the results of this check are presented in our final *Table* 4.

All of the methods used have a very definite value, and they are all in essential accord. In *Series* III five different tests showed complete agreement in 83.98 per cent of cases. Apparently, however, each test can occasionally give false results both as measured by other tests and as measured by clinical evidence, while on the other hand sometimes only one method gives the true results (*Table* 4). In general the Kolmer test will often give false negatives, never false positives; the cholesterolized antigens will give false positives and never false negatives; while the other tests erred in both directions in our hands. We should also mention that in our *Series I* running two amounts of patient's serum with the standard Kolmer antigen we never obtained a positive with the smaller amount (0.05 c. c.) and not with the larger amount (0.1 c. c.) of patient's serum on a blood which did not give a strongly positive reaction with cholesterolized antigen.

In attempting to correlate these tests with clinical evidence in *Table* 4 we were surprised to find cases of active syphilis, and particularly untreated cases of active syphilis well distributed throughout the table. We had believed that untreated cases particularly after the primary stage would give concordant results. Another unlooked for result is the general distribution of treated and untreated cases under all our headings, as we had expected both missed positive Kolmers and false positive cholesterolized tests to be predominantly among the treated. As between complement-fixation and precipitin tests it is apparent that both are missing some active cases, while the precipitin tests are picking up more false positives than are the complement-fixation tests.

Our *Series IV* emphasizes the point that by small variations in technic it is possible to influence results in either direction, and from this we deduce a word of warning regarding the interpretation of material presented under such generalities as Wassermann reaction, or precipitin tests. The true value of such work can be estimated only by a careful study of the details of the methods by one thoroughly familiar with laboratory technic. This same must apply to the results of

TABLE 3
TESTS IN SERIES III IN WHICH ONE METHOD GAVE RESULTS AT VARIANCE WITH ALL OTHER METHODS

	POSITIVE only	POSITIVE with	NEGATIVE only	NEGATIVE with	TOTAL	
A. Standard Kolmer	0	0	71	2.11%	71	2.11%
D. Cholesterolized 0.1%	36	1.07%	0	0	36	1.07%
E. Plain alcoholic	1	0.03%	2	0.06%	3	0.09%
G. Kahn Test	15	0.45%	7	0.21%	22	0.66%
H. Microscopic slide test	36	1.07%	14	0.42%	50	1.49%
G. and H. Precipitin tests vs. complement fixation	100	2.98%	9	0.27%	109	3.25%

TABLE 4

CORRELATION OF TESTS WITH CLINICAL EVIDENCE

Tabulation of replies from physicians regarding tests in Series III in which one method gave results at variance with all other methods (Table 3).

Method	Clinical evidence	Primary	Secondary	Tertiary	Latent	Total	Old Treated Case	Recent Treatment	Under Treatment	Treated Time Not Stated	No Treatment
Negative only with Standard Kolmer (A)	Past History of Syphilis					19	14	3		1	1
	Present Active Syphilis	2	8	3	1	14	2	2	4		6
	Probably Syphilitic					10	1				9
	Probably Non-syphilitic					3					3
Positive only with Cholesterolized (D)	Past History of Syphilis					9	7	1	1		
	Present Active Syphilis	2	2	3		7			2		5
	Probably Syphilitic					4					4
	Probably Non-syphilitic					11					11
Positive only with Alcoholic (E)	Probably Non-syphilitic					1					1
Negative only with Alcoholic (E)	Past History of Syphilis					1	1				
Positive only with Kahn (G)	Past History of Syphilis					2	2				
	Probably Syphilitic					3					3
	Probably Non-syphilitic					2					2
Negative only with Kahn (G)	Probably Syphilitic					2					2
Positive only with Microscopic (H)	Past History of Syphilis					6	6				
	Present Active Syphilis	1		1	1	3					3
	Probably Syphilitic					1					1
	Probably Non-syphilitic					9					9
Negative only with Microscopic (H)	Past History of Syphilis					2	2				
	Present Active Syphilis	1	1		1	3			1		2
	Probably Syphilitic					1					1
	Probably Non-syphilitic					1					1
Positive only with Kahn (G) & Microscopic (H)	Past History of Syphilis					16	13	3			
	Present Active Syphilis	5	4	1		10			2	1	7
	Probably Syphilitic					9					9
	Probably Non-syphilitic					19					19
Negative only with Kahn (G) & Microscopic (H)	Past History of Syphilis					2	2				
	Present Active Syphilis	2	1			3					3
	Probably Syphilitic					1					1
	Probably Non-syphilitic					1					1

two laboratories, if they are not using multiple tests on each specimen.

Finally there is this simple statement of fact: in these series there are many bloods which would have been reported either negative or four-plus had the laboratory relied upon a single method.

CONCLUSIONS

(1) No single method of testing blood for syphilis is entirely reliable.

(2) A laboratory in all fairness both to physician and patient should perform several different tests before making a final report. It is recommended that these should include a highly sensitive complement-fixation test together with a non-sensitive one, and a precipitin test, as a minimum.

(3) In interpretation of such tests the basic fact should always be remembered that the function of a laboratory is merely to aid in the diagnosis and treatment of disease and that laboratory results must always be interpreted in the light of clinical evidence.

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CHRONIC COLITIS AND ITS EFFECTS*

By ARTHUR W. WHITE, M.D., F.A.C.P.
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In man the evolution of the brain has outstripped that of the body. The body has been gradually forced to change to accommodate the brain; and now, in this advanced state, which we call civilization, the demand is for more luxury and comfort, convenience, expediency, swivel chairs, automobiles, modern toilets in our homes with consequently less opportunity for bodily development. As a result many things are developing which disturb the body economy, or even may menace it. Disturbances of the colon are becoming so prevalent that they are producing a definite effect on the economic life.

Chronic colitis has apparently been little understood. Da Costa says,

"Membranous and other chronic colon conditions are probably the result of emotional disturbances."

Schmidt compares colitis with bronchitis and asthma; the French and some American writers would prove a close association with sand or gravel and explain both as due to excessive uric acid.

It has not been long since most cases were auto-intoxication in the mind of the average physician. The symptoms, usually of a nervous type, were mistaken for evidence of toxemia.

Text-books have been prone to classify colonic troubles as membranous, hemorrhagic, mucous, and ulcerative. (The ulcerative type should properly be classed with the dysenteries and so does not come under the scope of this paper.) A type referred to by some authors as spastic until recently, has been given very little attention. This should not be considered as a separate entity, but as a concommitant of all of these, or rather a constant finding in all cases of chronic colon disease. The classifications usually thought of are merely incidental to, or sequences of, the disturbance of the musculature.

We must bear in mind the anatomical and physiological differences, at least as to function, of the various portions of the large bowel, if we are clinically to interpret the situation with any degree of understanding.

The colon is divided into three divisions: first, is the cecum from which most of the water is absorbed, and in which the content is churned very much as is the content of the stomach during the digestion of a meal. It has long been common theory that peristalsis begins reversely at the distal portion of the cecum extending downward toward the head for approximately one-third of its distance and producing a ballooning of the proximal two-thirds of the organ, which is immediately followed by a direct wave over the whole length of the cecum. During this process the contents are spilled over into the transverse colon where a definite direct peristalsis takes place. The contents are forced through the splenic flexure into the descending colon; in which, particularly in the lower portion, only a mass movement occurs.

The cecum and transverse colon are both innervated by Auerbach's plexus, the splanchnics and the vagus. The upper portion of the cecum, the transverse colon and the descending colon are supplied by nerves from two sources; an upper set from the lumbar spinal cord, through the sympathetic chain, and a lower set from the sacral cord through the pelvic nerves. The fibers of the former emerge by four of the upper lumbar nerve roots, enter the lateral chain of the sympathetic, then go to the mesenteric ganglion, from which fibers are sent to the solar plexus and also along the course of the colon.

Jacobi, Cannon, and Starling found that stimulation of the sympathetic produces inhibition of the movement of the whole colon, with tendency to constant contraction, but conversely, stimulation of the terminal nerve endings in the bowel produces a spasticity of the external muscles in the lumbar region, together with a spasticity of the muscles, particularly the circular fibers, of the transverse colon. Hence, the explanation of the common symptoms of lumbago in spasm of the transverse colon and the natural result in the colon, of irritation to the sympathetic system.

Starling has reported that he is able experimentally to produce a contraction of both coats of the descending colon by stimulation of the lower set, an easy explanation of the aggravated state in colitis in women during the menstrual period, and in men from prostatic or rectal irritation.

The myenteric reflex is responsible for a unity or sequence of action of the esophagus, stomach,

*Read in Section on Medicine, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

and intestinal tract. This reflex is dependent upon both the vagus and the sympathetic for perfect action, the general tonus of the organs depending upon the vagus. However, as Frank has shown, the tonicity may continue for some time after the vagus has been cut.

In any condition whereby the vagus is over stimulated, that is, stimulated past the point of balance, by the sympathetic, excessive tonus or spasticity occurs, and this may occur at any point of nerve distribution. Hence an irritable cecum or a disturbance of the motor action of the cecum, as from an adherent or inflamed appendix, brings about an increased tonicity of the stomach and intestinal tract reversely through Auerbach's plexus and to the vagus.

Again an irritating hyperchlorhydria may, and usually does, produce more or less spasticity of the colon. On the other hand an irritable bowel produces definite stomach symptoms, often both in motility and secretion, and in consequence other organs such as the liver and pancreas may be disturbed, and vicious, a cycle involving the stomach, liver and bowel may occur.

We are prone to find, too, heart disturbances both as cause and effect; bradycardia in a vagotonia and tachycardia in a sympatheticotonia case.

Magnus, in his later publications, as also Gunn and Underhill, Gaskill and very recently Alverez, lead us to believe that nerves are merely to conduct and not to produce: that the digestive tract is largely autonomous and the forces underlying peristalsis, normal or otherwise, must be found within the gut itself; that contractions of the intestinal muscle originate in the muscle.

Auerbach's plexus serves to conduct stimuli and to coordinate the activities of different parts of the tract.

Alvarez insists,

"That the current theories about the antagonism between the vagus and the sympathetic are pseudo-scientific and out of harmony with the facts, and that the sympathetic is an integral part of the central nervous system and not an outlying antagonistic brain."

Nevertheless we find, clinically, that the symptoms of the chronic bowel are distant. They are what we are wont to call nervous, as for example, headaches, difficulty in concentration. lumbago, variable appetite, sleeplessness, dreaming, palpitation or other disturbance of the heart's action, weakness or "collapsed feeling" associated with the bowel function (defecation), general and mental depression. Further; disease in any part of the body may set up a definite spasm of the colon, as also anything that irritates either the bowel locally or its terminal nerve endings, or over-stimulates the musculature may bring about spasticity. If any of these conditions obtain for a sufficient period, a chronicity may be brought about with congestion and hypertrophy of the mucus glands. Hence there may be found varying amounts of blood or mucus in the stools, or both.

There are certain plexuses in the abdomen, more or less independent in their make-up. The celiac plexus is made up of branches from the external spinal nerve roots, from the ninth dorsal to the fourth lumbar and connected with the vagus. This plexus is on a level with the ninth rib near the median line, in the epigastrium. It is intimately connected with the three other plexuses of particular importance, the ileocolic, lying in the angle between the ileum and the cecum, the plexus mesentericus superior, usually over the bifurcation of the aorta and the plexus mesentericus on the left side in a position corresponding to that of McBurney's point, on the right. By means of the close relationship between these plexuses, by nerve connections or an anastomosis, definite disturbance is transmitted from one organ in the abdomen to another. This is the Lorelei that lures the surgeon to diagnostic death, the patient continuing to have the appendicitis symptoms after the operation, as before.

The sympathetic system is very extensive and has ganglia distributed through the cord which send fibers to organs generally over the body; so that the colon is readily disturbed by any condition anywhere in the body, and conversely when irritated from any cause produces a number of distant symptoms of nervous type. It is a matter of clinical observation that except for certain evidences found in the study of the feces, the whole symptomatology of colon disease is nervous, or referred.

Therefore, and this is borne out by clinical observation, practically all cases of chronic colitis of the simple type are spastic in origin and kind. During the course of the disease, they may appear from time to time as either mucous or hemorrhagic, but the spasticity is common to all.

The so-called membranous type is misnamed, the apparent membrane being mucus in fact. Schmidt who made a very extensive study of this says,

"These bands or membranes, which are often so opaque that they are unfitted for microscopic examina-

tion without section, do not differ from ordinary mucus except that 9 to 10 per cent of fat is impregnated in their substance. This form is not soluble as ordinary mucus is, but is coagulated like shrivelled epithelial cells. No change has taken place except in the function of fat elimination."

There are many factors which have a direct bearing upon the condition of the colon, as it is very sensitive and responsive in its muscular action. A chronic or adherent appendix, by interfering with the motile function of the cecum may disturb the physiologic activity of the whole colon. A relaxed nephrocolic ligament on the right side allowing the cecum to rotate on its own axis produces a similar effect. A coloptosis may be sufficient and in fact is a common cause of irritable bowel. Things ingested which may produce gas or directly irritate the mucosa, as well as laxatives and cathartics are fertile sources of this trouble.

Consequently, a wide survey should be made of these patients, and everything taken care of that can either directly or indirectly affect the colon, even to the consideration of the mental and nervous make-up of the patient himself, before direct treatment is instituted. The detailed effect of food is a very important factor in these cases but time forbids me to give it due consideration. Suffice it to say, that each case demands individual consideration. The knowledge of the function of elimination of various types of food, and the determination of the time element in cecal function are important. Irritating and gas producing foods must be eliminated and those foods selected which furnish the proper proportion of bulk and are least irritating to the bowel. These are the essential principles upon which the direct treatment must be based if subsequent studies prove the later teachings of the physiologists that

"The key to an understanding of the peristalsis is to be found in a study of the smooth muscle in the wall of the bowel."

Treatment doing away with any irritation to the bowel directly should be sufficient to insure results. Further, the old question of which occurs first, in a given case, the disturbed nervous system, or the irritable bowel, is readily answered.

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DISCUSSION (*Abstract*)

Dr. J. Russell Verbrycke, Jr., Washington, D. C.—I divide the colitides into simple colitis (sometimes called mucus colitis or membranous colitis) ulcerative colitis, phlegmonous colitis, and the specific forms of colitis. By some men all of these except the specific forms of colitis are considered to be, instead of independent entities, various stages of one process. I have never subscribed to this view. Inasmuch as the paper deals only with the simple forms and its relations I will discuss only these. Most observers are agreed that this form of colitis is in the nature of a symptom rather than a disease; that is, it is a reflection from some other part of the body, usually either from the nervous system or from a disease elsewhere in the abdomen such as appendicitis, or gall bladder disease. I do not believe that simple colitis *per se* is very important either in the production of symptoms or in affecting health, but that the causative factor may be very important. Experience teaches, for instance that when one has concomitant disease of the gall bladder and colitis, after removal of the gall bladder the colitis disappears in over 50 per cent of cases without further treatment.

Dr. White is correct in stating that most cases of colitis are accompanied by an irritability or spasm and this may be called spastic colitis. It is possible to have colitis with an atonic colon but, on the other hand, it is possible to have colonic spasm without colitis. I still like the theory of vagus and sympathetic antagonism, in spite of its being called pseudo-scientific, because it adequately explains the clinical findings. I believe that the frequently associated vagotonia is the cause of the protean symptoms often found in the patient with colitis.

ONE HUNDRED FIFTY-FIVE CASES OF CHRONIC MUCOUS COLITIS*

By MARVIN SMITH, M.D.,
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I shall make no reference to ulcerative colitis, to bacillary dysentery or to the so-called specific infections of the colon, but only to that common, every-day type of colitis in which the inflammation is chronic and characterized by excessive mucus.

Mucous colitis is an inflammation of the large bowel with the presence of abnormal mucus. The two well known classifications are the atrophic, characterized by the presence of dry strings or tough films of mucus which are seen by proctoscope lining the bowel wall or hanging across the lumen, with the mucous membrane thinned

*Read in Section on Gastro-Enterology, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

out, blanched and lifeless looking; and the hypertrophic type, with thick lumpy masses of watery mucus resting in the bowel or covering the mucosa which is deeply engorged, reddened, edematous and weeping. To these types I wish to add a third classification which I have not seen described in the literature and which I wish to designate as the alternating type: This variety at times shows the characteristics of either the atrophic or the hypertrophic with mucus, but differs distinctly from them by exhibiting alternately constipation and diarrhea. This type I have found frequent in the Miami district.

Atrophic cases complain of auto-intoxication, asthenia, pallor, anorexia, pruritus ani, often accompanied by low grade temperature, headache, dizziness, general malaise and frequently extreme drowsiness and inability to concentrate the thoughts, and finally mental depression. The feces are of a dark color, have a strong indol or hydrogen sulphid odor and sink quickly in water.

Hypertrophic cases complain of abnormal fermentation, gaseous distention, extreme irritability, restlessness, and have free bowel movements, not necessarily diarrhea. They often run a low grade temperature, and have much rumbling and gurgling of gas. The feces are light colored, with a sour odor, and usually float on water.

Alternating cases may resemble either of the other two in general complaint, but are different in that there is a constantly changing state between constipation and diarrhea or tightness and looseness of the bowels. Extreme drowsiness has been especially noticed in this type. The feces may sink or float depending upon the state of the bowels.

In the past, there has been much speculation about the function and pathology of the colon. There has for centuries been a well founded suspicion of the bearing that colon derangements may have upon the general well being of the individual, but it has been left for the modern physician to seek the truth and search out the facts and bring the indictment against this part of the digestive tube.

There seems to be a growing interest in the scientific diagnosis and treatment of colonic diseases. From January to June of this year there were written by independent investigators and published in the leading medical journals of the world, twenty original articles on constipation, twenty-six on colitis, and twenty on diarrhea. None of these essayists has manifested the courage to say that he has covered his subject exhaustively. The element of doubt which has for long beclouded the atmosphere concerning the nature, etiology, treatment and final outcome of colitis and allied ailments of this viscus has tantalized the profession until at last it appears that united action is about to be inaugurated to work out and settle for once and for all the controversy about colitis which has continued for decades. This much despised cess-pool of the body now seems to occupy the center of the stage.

In chronic mucous colitis there is a part played by heredity, according to Draper and Johnson, in so far as the rotation, shape, size and evolution of the colon are concerned; there is a part played by the psychic and emotional factors producing the so-called "born neurasthenics" as described by McLester; there is a part played by occupation and environment; there is a part played by foods as set forth by Alvarez and many others; there is a part played by trauma, chemical and mechanical interferences; by foci of infection and last there is a part played by bacterial invasion as set forth particularly by Bassler.

In each and every case all these factors must be worked out. Certainly they contribute to the complexity of the picture, but I cannot feel that chronic mucous colitis should be looked upon merely as a symptom-complex unless all the factors named above except the psychic and emotional are ruled out. Neither do I feel that any physician is justified in saying that a mucous colitis is simply the result of a nervous state until he has by careful diagnostic methods tested for the other factors. The neurologists have wrestled with this problem for years and have for a long time crossed swords with the gastro-enterologists about mucous states of the colon. At the present time, I am convinced that much of the mucus trouble in the colon is an independent disease.

The two most trustworthy phenomena associated with chronic mucous colitis are constipation and diarrhea and the most persistent single evidence of a chronic mucous colitis is the presence of mucus in the feces: I mean a tendency to tightness or looseness of the bowels, rather than a frank obstipation or diarrhea. Look for mucus.

Elbert Hubbard recognized the role played by constipation and its influence upon society and the economic status of the people when he wrote,

"In the race of life the man with educated bowels will eclipse the man with an educated brain, and drugs and chemicals that work while you sleep are a little later going to prevent your working when awake."

It is not astonishing that millions of laymen and many physicians are concerned about colitis, not because of its immediate high mortality rate, but because of its morbidity and frequency.

In reviewing the last thousand records of gastro-intestinal diseases in my own practice, I find that according to history, sigmoid examination, x-ray examination and bacteriological examination, about one-fourth of them showed the unmistakable signs of chronic mucous colitis. I cannot therefore agree with O'Connor who states that preventive medicine has "furthermore largely eradicated the vast majority of intestinal inflammations;" but on the contrary it is my opinion that the predisposing, if not the exciting factors of this condition are on the increase and the total number of individuals grows larger day by day. The more we search for this trouble, the more we shall find it.

There is comparatively little practical knowledge among laymen about the scientific selection, combination or preparation of foods. The average person eats whatever he wishes and will continue to eat it, regardless of consequences.

Almost everyone travels now-a-days by automobile. People think nothing of making from fifty to five hundred miles a day. They disregard the fact that every start and stop of the car and every wave and irregularity or wrinkle on the road and every vibration of the auto, churns the bowels up and down in the pelvis, strains and stretches the mesentery and puts tension on the nerve and blood supply, flaps the transverse colon up and down, injuring it and jamming other organs, thus traumatizing the gut walls, paving the way and preparing the soil for bacterial invasion, finally causing the individual to reap a full-fledged case of chronic mucous colitis. There is a decided difference in the intra-abdominal motion and vibration of the viscera in riding on a smooth level steel track by train or street car, in which case the motion is backward and forward, and in riding on an uneven surface where every irregularity in the highway produces a sudden jarring and drives the viscera, with terrific force, from top to bottom of the abdominal cavity.

DIAGNOSIS

Accuracy of diagnosis in gastro-intestinal diseases generally, is greatly to be desired but difficult of attainment. It entails laborious work, great patience and long suffering. Personally, I have found it especially difficult to unravel the hidden truth about any case of chronic mucous colitis. I confess that during the past fifteen years in which I have been trying to treat gastro-intestinal diseases, often I have been disappointed and discouraged with my numerous failures. Within the last three years I have gotten my system of diagnosis and management a little better organized, and although I do not eulogize it for its merit or hold it up as ideal, yet I am trying to employ it as a daily routine until I find one that seems to give more satisfaction. Fortunately, the more one studies this subject the more interesting it becomes.

On each patient we take a written record which covers family history, past history, and history of present illness, endeavoring to elicit important complaints, also to get some insight into the patient's psychic state; and in recording, we endeavor to separate as far as possible, the real from what appear to be the imaginary troubles. It is only when no other cause can be found that we have recourse to the theory of purely metabolic or nervous disturbances. We put the patient on Schmidt's test diet for 72 hours if there is constipation, or perhaps less if there is looseness of the bowels. At the end of this period we require a whole bowel movement to be brought to the laboratory for complete study, which will be taken up in detail later.

We next do a complete physical examination to determine local causes and to eliminate septic foci in tonsils, sinuses, teeth or elsewhere. We then do a careful sigmoidoscopic examination to observe the mucosa of the rectum and lower sigmoid. This is undoubtedly the most essential single step in the entire diagnostic routine. We do urinalysis, gastric analysis, blood examination and basal metabolism.

The fluoroscopic and x-ray study make up the second most fundamental step in the diagnosis of a chronic colitis. Kantor states that:

"Roentgenologically, the diagnosis of colitis can be made either after the ingestion of a barium meal or after the injection of a barium enema. The former method is by far the more useful for the demonstration of the early, simple and mild case."

I have not found it safe or accurate to depend solely upon any single agent to make a diagnosis, but attempt to harmonize my x-ray and fluoroscopic findings with the sigmoidoscopic and bacteriological findings. Many and divers misfits and irregularities arise in trying to do this, but by persistence and as my experience increases,

I can recognize slight improvement from month to month in my efforts.

Now for a study of the fecal specimen. We examine it macroscopically and chemically according to the plan of Schmidt and then microscopically; we "set up for hooks" according to Bass and do fermentation tests as a routine, then proceed to the bacterteriological consideration of the specimen which is important, interesting and very difficult. Since this part of the diagnostic procedure is of vital import, I have found it necessary in my own laboratory to set apart two mornings a week, Mondays and Thursdays, just for this detail study in order that the routine may not be disturbed. If some such plan as this is not adopted for the bacteriological part of the work, it cannot be pursued successfully in the average man's laboratory. The physician should help perform this portion of the work himself and not leave it entirely to the technician no matter how efficient he may be.

The gastro-enterologist quickly recognizes the relationship between a particular type and chemical reaction of a fecal specimen, and the bacteria that will usually appear in the incubator forty-eight hours later; and this in turn can be connected with the sigmoid and x-ray observations soon to be at hand.

First an emulsion of the feces is made by taking a loopful of the semi-solid specimen, placing it in 10 c. c. of sterile distilled water and then putting 1 c. c. of this emulsion on each of two medium plates: one plate contains Ayers-Rupp medium which grows proteolytic organisms, and the other Torrey's medium, which grows aciduric organisms. These are incubated for 48 hours at a temperature of 37.50 C. At the end of this time the two plates are taken out and each placed in the counting apparatus. The number of colonies is counted and the ratio between the proteolytic and the aciduric organisms determined. Bassler at this point makes a direct smear, stains with Gram stain and determines the ratio in this way. Cannon works the colon-acidophilus ratio out by using the counting apparatus and enumerating the colonies, and it is this method chiefly that I have pursued in my work. Bacillus coli represents the proteolytic organisms and acidophilus the aciduric. The counting of the colonies having been completed, slides from both plates are made, organisms stained with Gram's differential stain, and a descriptive record of the bacteria is placed in our record book for that purpose. If it is desirable to test out the predominating organisms on the sugars or other media these platings are done at this stage of the process. The predominating organisms having been settled and the ratio worked out, the plan of treatment must next be decided. Normal feces contain proteolytic and aciduric organisms in the ratio of 3:1.

MANAGEMENT

In adopting a scheme of treatment, one of the first things to be settled is whether the psychoneurotic manifestations of the patient make up a partial cause or a partial effect of the colitis. No one would deny that the emotions disturb the functions of the digestive tract to some extent, as was shown by Ryle.

Since chronicity is a common and dreaded quality of gastro-intestinal diseases, many of these patients sooner or later show mental depression and need strong reassurance and encouragement. Above all, they need cheerfulness, optimistic surroundings and sympathetic helpfulness.

Focal infections if present, should receive proper attention, because we are unable to tell just how extensively they may influence the colitis. Some investigators believe that colitis is secondary to infected teeth, tonsils or other foci. Hagyard reports a series of 230 colitis cases in which 50 per cent showed infected tonsils or pyorrhea, and a co-existing chronic colitis and chronic cholecystitis occurred in 59 cases.

If the chemical findings in the stomach are abnormal, this should receive proper consideration. Gastric hyperacidity is usually found with hypertrophic colitis, and anacidity or subacidity with atrophic cases. Robbins, Torrey, Cannon and others have shown that when a colitis exists with a proteolytic infection as a constant factor, a low protein, high carbohydrate diet is favorable. Vegetables, especially the smooth, tender, non-irritating variety and lactose and dextrose are very serviceable, in changing the flora. Dextri-maltose 2 is also especially useful. If a saccharo-butyric type of infection predominates in the colon, then a heavy protein diet with limited cellulose and carbohydrates is indicated. I agree with Knappenberger that rest of the colon is essential in treatment, but I do not concur in his belief that an anti-constipation diet is harmful in the handling of atrophic colitis. The colon has already rested too long, and if the infection is to be overcome, stasis must be removed and that without medication, but with diet. In this connection, Stewart states: "In cases where the best laxative dietary obtainable does not relieve the existing stasis, the use of paraffin oil, agar psyllium or bran will often be found useful."

All colitis cases should have the benefit of good hygienic surroundings, sunshine and fresh air and daily walks in the open. Particularly the saccharo-butyric cases do not tolerate much exercise although a quiet outdoor life is most favorable. Daily tepid baths should be given,

also sun baths on the bare abdomen in the subtropics are helpful.

Autoing should be limited in all forms of colitis. Electricity has its place in the plan of treatment: diathermy, sinusoidal currents, infrared or therapeutic light are helpful especially in the atrophic type of this disease.

At times I have employed colonic injections and irrigations of which there are many. Some seem at times to bring satisfactory results.

In my belief, most important of all the treatments, is the bacterial. Regardless of opinions to the contrary, I am firm in my belief, that mucous colitis is primarily a disease of bacterial infection of the mucous membrane. In this, I cannot commend too highly the excellent system of treatment worked out by Bassler which consists of three methods: (1) bio-chemical alteration; (2) bacterial antagonisms; and (3) vaccines. I have used all of these treatments over several hundred cases and have seen most gratifying results. The saccharo-butyric organisms most frequently encountered are, *B. aerogenes capsulatus,* Gram-positive diplococci, Gram-positive single cocci, *B. bifidus, B. putrificus.* The proteolytic are *B. coli communis, B. mesentericus, B. liquefacius, B. proteus,* Gram-negative streptococci, and staphylocci.

Surgery has its place, even in the handling of chronic mucous colitis cases, but it is limited to that comparatively small group that persistently fails to yield to every other rational line of treatment. Surgery consists of the undoing of kinks, cecostomy for through and through drainage, ileo-sigmoidostomy or partial or complete colectomy.

SUMMARY

A summary of the 155 foregoing cases shows 101, atrophic; 36, hypertrophic, and 18, alternating. Seventy-two of these colitis cases were treated by diet, irrigations, and electro-therapy. There were 44 good results, 23 were improved and 3 unimproved. Forty-five were treated by bacteriacidal methods and diet, 39 with good results and 3 were unimproved. Seventeen were treated by surgical means and diet, 14 with good results, 1 improved and 2 unimproved. Twenty-one took no treatment.

Forty-nine of the total number of cases had foci of infection which were treated, and thirty-four had previous abdominal operations.

At the present time there is no ideal plan of managing chronic mucous colitis; all methods are beset with difficulties and disappointments.

Our knowledge of colon bacteriology and immunity is meager. However, when I review, in an impartial and unbiased manner, the results obtained in this small series of 155 cases and recall the startling recovery and lasting relief that has come to many of these sufferers from vaccine and culture therapy, I am convinced that it holds great possibilities for the future.

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DISCUSSION (*Abstract*)

Dr. John L. Jelks, Memphis, Tenn.—If you have a colitis there is a cause for it and it is your duty to learn the cause. I do not know what mucous colitis is. Colitis always is productive of mucus. If there is an infection with *Ameba histolytica* there is mucous colitis. If there is an infection with the flagellates there will be a mucous colitis. If there are adhesions and the condition first described by Jackson, there will be mucous colitis. If there is obstipation or constipation productive of irritation causing stasis, there will be mucous colitis. I could mention many other conditions.

Dr. G. C. Mizell, Atlanta, Ga.—When I was in college twenty-eight years ago, I was taught that mucous colitis was a definite condition, of which the chief characteristics were constipation for a period of time followed by the presence of pain until there was an evacuation of a large amount of mucus. After the evacuation of the mucus there was freedom from pain. In twenty-four years of this kind of work I have seen very few cases of classical mucous colitis as I have understood it and as the condition was taught me.

The layman understands all about the roughage idea in the treatment of stasis. Most patients have

already tried a rough diet before they come in for the relief of constipation. To me it is a question whether any case of stasis should have a rough diet or a diet containing a large amount of residue. All the hollow organs in the body tend to accommodate themselves to their contents, not in one day or two weeks or two months, but in years. One who is a large eater has a large stomach. If he will reduce the quantity of food that he eats he will in a few years have a small stomach. The same principle applied to the colon will hold good; avoid a large amount of residue, keep the colon clear, not by purgatives but by non-irritating methods and the large dilated colon will contract to a reasonable size.

Dr. Smith (closing).—Chronic mucous colitis is probably the most common gastro-intestinal ailment of the present age. As the days and years have come and gone, improved methods of study of feces have been evolved just as in other lines in the science of medicine. The antiquated method referred to by Dr. Mizell twenty-five years ago, cannot be looked upon today as a standard. All cases that show large masses of mucus in the defecation are certainly mucous colitis cases, but we must not forget that the type that Dr. Mizell refers to is comparatively rare and represents only a very insignificant percentage of the individuals who have an out-pouring of mucus. Our improved methods of determining normal and abnormal mucus in the feces has shown that one person out of every three or four who has gastro-intestinal disease, has chronic mucous colitis.

Cannon has demonstrated beyond the peradventure of a doubt, in his experiments on white rats, that where constipation persists the gut proteolytic infections cannot be eradicated. Therefore, the first thing to be accomplished in every case is to remove all hindrances to normal bowel motion. This cannot be done without the administration of a diet rich in cellulose, thus creating bulk and carrying much needed moisture. I am opposed to the feeding of coarse, scratchy fiber, but have had very gratifying results when my patients adhere to a smooth, non-irritating, bulky diet and are given culture and vaccine therapy as previously described.

INTRACRANIAL HEMORRHAGE FOLLOWING HEAD INJURY*†

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Extravasation of blood within the cranial cavity is a frequent result of head injury, and this possibility must be considered in every case of sufficient severity to stun the patient even momentarily. The frequency of localized collections of blood from torn dural vessels or from those more closely related to the brain substance, has been variously estimated by different observers. Likewise there seems to be little agreement as to the relative effects of subdural clots of moderate size when associated with extensive lacerations of the cerebral tissues. The rather widespread employment of spinal puncture in the study of acute brain injuries makes it possible to detect intradural bleeding from ruptured cortical vessels and to some extent gauge the severity of the injury by the amount of blood within the spinal fluid. Spinal puncture, however, gives no information as to the location of the intradural hemorrhage, nor is it possible to know from spinal puncture whether the patient has a large clot or whether the bleeding is from small vessels in contact with the large fluid spaces.

In the large majority of cases subdural bleeding is associated with serious injury to the brain tissue and the resulting intracranial pressure is the effect of the space restriction of the clot plus edema of the adjacent cerebral tissues. While edema of the brain has been accepted as a very constant effect of cerebral contusion and laceration, it is probable that more importance should be given to the space-restricting effects of subdural hemorrhage itself. Vance, writing on this subject in the *Archives of Surgery*, May, 1927, reports 507 necropsies of head injuries, and of these the cause of death was subdural bleeding in 132 instances. In no case of this series was cerebral edema assigned as a cause of death.[1] Lecount's excellent article is of great interest in this connection. In a series of 504 autopsies on skull fractures, he reports 157 large subdural hemorrhages.

There is no typical picture of gross subdural hemorrhage. The extravasation of blood is only a part of the pathological picture, and the patient's symptoms are logically the result of a combination of edema, contusion or laceration of brain tissues and the localized hemorrhage. Such patients are often profoundly unconscious, which adds greatly to the difficulties of diagnosis. In those less seriously ill the appearance of focal symptoms in addition to the signs of intracranial pressure, may indicate the location of the clot. A localized contusion of the brain, however, produced by contrecoup violence, may often cause as much paralysis of the contralateral arm or leg, as a subdural clot, and unless there is marked evidence of generalized pressure,

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*Read in Section on Surgery, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†From the Department of Neurological Surgery, Medical College of Virginia.

1. Pathologic Anatomy of Traumatic Fractures of Cranial Bones and Concomitant Brain Injuries. E. R. Lecount, M.D., and Carl W. Apfeldach, Chicago. J. A. M. A., vol. 74, p. 501.

we have followed a waiting policy in such cases.

Leucocytosis, fever, rigidity of the neck muscles and bloody cerebrospinal fluid are quite constantly found in subdural bleeding, but the one most uniform effect of this condition, is an elevation of intracranial pressure. We know of no method of determining the intracranial tension of acute head injury that compares in value with that of measurement of the spinal fluid pressure at lumbar puncture. There may be an element of danger in lumbar puncture when performed for diagnosis in head injuries, and the procedure should be used with judgment, but we prefer to accept this slight risk rather than undergo the uncertainty which to us is an almost inevitable accompaniment of the ordinary neurological examination made for the purpose of determining pressure in many recent head injury patients.

The type of injury appears to be of some importance in the production of subdural bleeding. Blows upon the occiput, head the list as causes of subdural hemorrhage, while direct frontal injuries rarely cause bleeding beneath the membranes. In a series of 173 proven skull fractures in my service, from October 1, 1925 to November 1, 1927, there were 13 large subdural hemorrhages, and these hemorrhages appeared to be the chief result of the injury. Eleven of these patients were operated upon, with four deaths. In two patients not operated upon, large subdural hemorrhages were demonstrated at autopsy. The low incidence of subdural hemorrhage in our series of 173 fractures of the skull, 7.5 per cent, as compared to 26 per cent in the series of Vance, is due in part to our inability to secure an autopsy examination in any considerable percentage of coroner's cases. As might be expected, the mortality of gross subdural hemorrhage is extremely high. The condition of the patient is often so grave that an adequate operation for removal of the clot, even when it is precisely localized, is a procedure which carries great risk. The acute cases if operated upon at all, are usually given a subtemporal decompression in an effort to offset the effects of general pressure. It is in this type of case that we find the contused, dry, protruding brain at operation, and the failure of subtemporal decompression to relieve effectively the high tension, has been frequently noted.

There is a growing tendency in some clinics to abandon decompression operations in favor of spinal puncture, magnesium sulphate and hypertonic solutions intravenously. Conservative treatment of this sort while helpful in removing the edema associated with hemorrhage formation or contusion, and valuable in moderate pressure, should not be seriously relied upon for reduction of severe intracranial pressure. We consider spinal puncture as a diagnostic aid rather than a therapeutic procedure in these cases. Unless the fracture itself points to the location of the clot or requires investigation for some other reason, a right-sided decompression is usually done when the studies of the case indicate that the patient's pressure is advancing to a dangerous stage. It is rare that clots of considerable size are removed at subtemporal decompression; but more often the brain protrudes under great tension and the cortex may show only small hemorrhagic extravasations.

We have been impressed in recent years with the importance of a large bone removal at subtemporal decompression if the tension appears to be high. It is possible in only a few cases to reduce the tension by ventricular puncture at operation. The bone opening of decompression may be very much smaller, however, if the intradural pressure is caused by an accumulation of subdural fluid, as described by Naffziger.

It has been of some interest to note the amount of hemoglobin in spinal fluid following head injury, and we have no record of recovery of any patient in our series whose spinal fluid hemoglobin was more than 25 per cent. It is very probable when there is a large amount of blood in the spinal fluid, that the injury involves the more vital structures about the base, thus allowing the blood to be thrown directly into the large cisterns, and more particularly those of the posterior fossa. Exceptions to the above have been noted when shortly after serious injury the patient appears to be rapidly going into respiratory failure. The withdrawal of very bloody fluid at spinal puncture has caused a prompt improvement in condition. We regarded these cases as having medullary embarrassment from accumulation of bloody fluid plus the effects of the injury to the nervous tissue. All of these cases were in children.

In the series of 173 fractures of the skull which have been considered in this paper, intracerebral hemorrhage has been encountered a few times. In one patient with a fractured skull, about one ounce of subcortical blood was evacuated from Broca's area. The case was thought to be one of extradural hemorrhage before operation. In another patient one ounce of blood was evacuated from the left lobe of the cerebellum about five weeks after injury. This patient was considered to be a glioma suspect with

hemorrhage into the tumor, but he has remained symptom-free more than two years after operation, and it is probable that the hemorrhage was of traumatic origin.

A very interesting type of subdural hemorrhage is the chronic hematoma which may arise from apparently trivial injury, often received many weeks or months before. We have treated six of these cases, four being operated upon since January 1, 1925. While there is generally a long latent interval between the injury and the onset of pressure symptoms, there is sometimes a history of continuous disability, showing that considerable hemorrhage was extravasated on the cortex before the subsequent encapsulation by the membranes. Of the six cases, all recovered following removal of the clot through an osteoplastic flap. In none of these cases did the symptoms of the patient indicate that the clot was bilateral, and the patients have been symptom-free since the operation. A correct pre-operative diagnosis was made in three patients; frontal tumor was suspected in the remaining three. The symptoms of patients with subdural hematoma will naturally depend upon the location of the encysted clot. Inasmuch as the clot is usually very extensive and is slowly compressing the cortex, there may be a striking absence of any focal signs. The symptoms, therefore, are very much like those of brain tumor, with marked mental alteration and psychosis. It was necessary to use an air injection after Dandy's method in two of the cases to determine the side involved. In every case the clot was an enormous one and covered the greater portion of the cortex of one hemisphere. In one very interesting recent case not included in the six above reported, a typical subdural hematoma was found as a result of hemorrhage from a large glioma of the cortex. The yellow pigmentation of the clot and the cyst formation were identical with the cases due to trauma. It has been remarked by others that chronic subdural hemorrhage is of much more frequent occurrence than is generally believed, and it may explain the headache and neuroses of certain chronic injuries.

Of the cases of intracranial hemorrhage, those arising from the middle meningeal artery or its branches have received the greatest attention. Statistics on the incidence of extradural hemorrhage indicate that intracranial bleeding of this type is of frequent occurrence. Vance's autopsies in 507 cases found extradural hemorrhage the cause of death in 61. Lecount in 504 autopsies on skull fracture cases, found extradural hemorrhage in 104. In our series of 173 fractures, we have listed six extradural hemorrhages, or 3.5 per cent. Many of the fatal cases which did not come to autopsy may have had extradural bleeding. The symptoms of extradural hemorrhage need not be dwelt upon here. They are the outcome of a rapidly advancing compression, often with such focal symptoms as might be expected from impairment of the underlying cortex by direct pressure. While theoretically the diagnosis should be easy, we have frequently found it to be most difficult, and to be reached only after much hesitation and fumbling. The blood pressure upon which much reliance has been placed, is as often low as it is high. In one patient 55 years of age, with a large extradural clot, the blood pressure ranged from 105 to 120. If preference be given to any one sign or symptom in the diagnosis of extradural hemorrhage, we would emphasize the dilatation of the pupil on the side of the clot. There may be much variation in the size of the homolateral pupil, but in the majority of cases we believe that it will become dilated and fixed.

In one case, a large extradural clot was found on the right side and a large subdural clot on the left. The pupils were at first equal and contracted, but in a few hours dilatation with fixation of the pupil was found on the side of the extradural clot. Increasing aphasia and signs of continuing pressure required a second operation upon the left side, and a large subdural clot was evacuated. The patient made an excellent recovery.

The majority of extradural hemorrhages that we have treated have been due to baseball injuries. These cases should present ideal conditions for precise diagnosis, but they do not always do so. Some of them have had no lucid interval, no elevation of blood pressure and no undue slowing of the pulse. Involvement of the motor area was the principal symptom which led to exploration. As a rule we have not opened the dura in these cases, inasmuch as the removal of the clot left the dura perfectly flabby. A clot sometimes reforms after operation, not from the arteries, but from some of the veins. Secondary clot formation is facilitated by the large space left after removal of the primary clot. In the patients who have severe head injuries and depressed fractures, extradural bleeding is very rare, but it does occur perhaps more frequently than is suspected in injuries of the occiput with contrecoup violence in both temporal regions. Difficulties of diagnosis are increased because of unconsciousness and signs of diffuse brain disturbance due to subdural hem-

orrhages. In these cases an extradural clot may be entirely overlooked. If the patient is suspected of having an extradural hemorrhage, spinal puncture is of no particular value and adds to the dangers of medullary compression. It furnishes practically no information which cannot be obtained by less dangerous means. No time should be lost in removing the clot of extradural hemorrhage. These patients often die in the railroad station while being transported to the hospital. In our experience the majority of them have been seen after the onset of coma. Repeated examinations should be made to arrive at a decision as to the presence or absence of a clot, at the earliest possible moment. If the patient becomes profoundly unconscious from the increasing compression the mortality is extremely high, even though the clot be removed. In the six cases listed in our series of 173 skull fractures, death occurred in one case. This patient was more than 70 years of age and had associated injuries.

The main purpose of this paper is to call attention to the fact that the symptoms of head injury patients often rest upon a very gross pathologic basis, and that hemorrhage, subdural or extradural, as shown from reliable statistics, is of frequent occurrence. The cause of death as shown by Lecount's and Vance's statistics, in those patients not dying of shock, is found to be hemorrhage, either subdural or extradural, in a large percentage of cases.

Indications for operation in head trauma cases are based upon gross intracranial hemorrhage and compound or depressed fractures of the skull in addition to about 10 per cent which are suspected of being due to edema of the brain. In the cases of so-called edema, it is believed that gross subdural hemorrhages are frequently associated, and if this is true it is an error to rely upon palliative treatment in the presence of severe compression. When the patient has emerged from the stage of shock, during which operation should not be done, whatever surgical procedure is necessary can generally be accomplished under local anesthesia. If the patient's restlessness should make it necessary to employ a general anesthetic, we have noted this fact as a relative contraindication to operation, which may be set aside, however, if other features of the case urgently demand operation.

DISCUSSION (*Abstract*)

Dr. Charles E. Dowman, Atlanta, Ga.—Many years ago there was a tendency to consider that all cases of brain injury should be operated upon. Then there was a period of conservatism, and now Dr. Coleman has wisely warned against allowing the pendulum to swing too far in this direction. I have been guilty of conveying the impression that the conservative treatment of head injuries is the treatment of choice. I have not intended to do that. I have simply emphasized the fact that there is a large group of cases that should not be treated by operation.

In a series of 451 cases occurring in my own service in the past four years 50 per cent were treated conservatively. These were cases of definite brain injury with no evidence of increased intracranial pressure, but cases that experience has shown would have developed increased tension, on account of fluid accumulation, if hypertonic treatment had not been used. In 20 per cent of the cases there were definite indications for operation on account of depressed fractures with or without localized brain contusion. The diagnosis in such cases is self-evident and there is no trouble in deciding that these patients should be operated upon.

A third group is that of which Dr. Coleman has spoken, namely, cases of middle meningeal hemorrhage. These should be operated upon as soon as possible. The diagnosis of middle meningeal hemorrhage is not always easy. We depend chiefly upon the gradual development of unilateral neurological manifestations, rather than an increase in the blood pressure and a bradycardia. The so-called "lucid interval" in such cases is interesting. Many surgeons interpret this as meaning the interval between the initial unconsciousness and the late profound unconsciousness. This is erroneous. It is much better to interpret the "lucid interval" as meaning the period between the time of injury and the development of unilateral irritative or paralytic manifestations. If one waits for the profound unconsciousness the patient usually dies because of the great pressure on the brain.

In the fourth group are the cases of gross subdural hemorrhage. It is difficult to give a rule of thumb for the diagnosis of such cases. It is often largely a matter of "hunch." Any patient who has a high spinal fluid pressure, a persisting and increasing unconsciousness, and a dilatation of the retinal veins, most probably has an intradural hemorrhage and should therefore be operated upon. The operation of choice is a decompression.

The chronic cases of subdural hemorrhage which Dr. Coleman mentioned are very interesting. They have fooled us all. The last case of this nature which I have seen was a child with a depressed fracture who was operated upon last December. The localized contused brain was removed. A bilateral choking of the optic discs persisted in spite of hypertonic treatment. There were no other neurological manifestations. In July, six months after the first operation, I laid down a bone flap and found a large clot overlying the whole left cerebral hemisphere. Such cases are not uncommon and Dr. Coleman is correct in emphasizing the fact that the persistence of post-traumatic neurological manifestations may be due to chronic subdural hemorrhage.

Dr. Edward T. Newell, Chattanooga, Tenn.—A boy was brought to the Sanitarium who had been knocked down by an automobile sustaining a fracture of the left leg, wounds on the body and a fracture of the right radius. He was perfectly conscious before and during the reduction of the leg and arm fracture. Some hours later, after a period of drowsiness he

began to be restless, and the x-ray disclosed to my surprise a head fracture about two and a half inches long with a few ramifications, but no depression. The spinal fluid pressure was twenty-two, and fluid bloody. The next afternoon he became restless again and the tap was repeated. He later showed slight signs of irritation in the motor areas and some spasticity in the arm.

I did a subtemporal decompression but found no blood extra- or subdurally. There was no depression of the bone, corroborating the stereoscopic x-ray findings. Although I made a very wide opening in the skull the patient died the following day.

There was no indication of brain injury or fracture (except the x-ray) until we had cut down through the skin. Then we could see that the tissues had been traumatized. The diagnosis was first suggested by the clinical aspect of the case twelve hours after his triple injury, restlessness, and slight increase in pulse rate and respiration.

Dr. Coleman (closing).—Too much attention has been given to fractures *per se* in the discussion of head injury. A fracture may be found upon one side of the skull and an important cerebral injury upon the other. If operation is to be done in such a case, it should be done for the relief of cerebral symptoms, without reference to the fracture, unless there is depression of the bone fragments.

I did not intend to convey the impression that I am adopting a more radical treatment than I have heretofore practiced. I have come more and more to believe that unless an operation removes something from the cranial cavity when a patient has had a head injury, it does little good. This something may be a clot, collection of fluid or depressed fragments of bone.

While spinal puncture gives us valuable information, naturally, it must be employed with judgment. In brain tumor, especially if there is choked disc, we consider spinal puncture dangerous. The conditions in brain tumor, however, where pressure relations have been adjusted over periods of weeks or months, are different from those of acute cerebral injury, where there is not likely to be great sagging of the tentorium or herniation of the contents of the posterior fossa.

PRENATAL CARE AND ITS EFFECTS ON THE GROWTH AND DEVELOPMENT OF THE BABY*

By BASIL M. TAYLOR, M.D.,
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No greater tragedy can come to a young pregnant woman than to go through pregnancy, labor and the lactation period without complete, practical and scientific care. No amount of maternal affection and devotion can take the place of knowledge in problems of childbearing. Women have been going through this experience with no care for the growth and development of the baby. The medical profession has begun to educate the laity on the importance of prenatal care, but it has been with the purpose of preventing eclampsia. The one most concerned, the baby, has received but passing notice. Prenatal care is for the coming children and grandchildren primarily, and the mother secondarily.

If a pregnant woman arrives at labor without eclampsia or nephritis, we feel that we have accomplished our purpose. If this is the sum total of our accomplishments, we have done nothing worthy of notice; for very few women free from nephritis prior to pregnancy have eclampsia or albumen in their urine even if they receive no care at all. If there had been no eclampsia, it is highly probable that today we should be giving pregnant women no advice at all except to call us when labor begins. It is the tragedies incident to nephritis and eclampsia that have caused us to attempt to educate the laity as to the importance of prenatal care. An Obstetrician feels chagrined if through carelessness he has a nephritis or eclampsia, but he feels little or no chagrin at all at a five or a twelve pound baby. Future obstetrics will reveal to us that rickets and scurvy in the baby and eclampsia and nephritis in the mother will be negligible if we will direct our care to the correct development of the baby.

When a pregnant woman engages a physician he becomes a party to a most sacred and responsible contract. That contract should read about as follows:

"For and in consideration of the obstetric fee that this patient is able to pay me and for other considerations, I agree to assume the responsibility of giving her the proper care during pregnancy and labor and agree to leave her in as good or better condition than when I accepted this responsibility and agree to do my best to develop the baby to make it possible for it to be physically, mentally and morally fit for the duties of a good citizen in the community in which it will live."

Whether he realizes it or not every physician who accepts the care of an obstetric case is bound by the mother, the baby and society to live up to this contract. He has a nine months' task on his hands. Society is made up of the blunders and successes of the obstetrician.

He assumes the responsibility for two lives, one already made and one in the making. The one in the making is a helpless dependent baby, a future citizen. Up to a certain age the baby has no say so as to its physical, mental and moral destiny. It can only make the best of what its parents give it in the way of heredity first, and environment, second. The parents are

*Read in Section on Obstetrics, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

a finished product. They are what their parents made them from the standpoint of heredity. If they are defective, their offspring can but be defective. This is why we have many human misfits. The father does not play as important a part in the development of the baby as the mother. The baby inherits something, but does not derive its nourishment from the father. It is the mother's food and endocrin hormones through the placental circulation that nourish and develop the baby. If she has a faulty digestion, a poorly balanced food, a defective endocrin system furnishing inadequate hormones in her circulation, the baby can but face labor, babyhood and manhood with many handicaps. The curtain that is between us and the stage of development has not been drawn aside sufficiently for us to see how much our lack of scientific, practical prenatal care, and our poor obstetrics are responsible for the inmates of jails, houses of prostitution, epileptic colonies, feeble minded homes and asylums. You may ask what has prenatal care to do with these? Future scientific medicine will some day reveal how great a part our obstetric blunders have played in them. If we could fully realize the responsibility imposed upon us in assuming charge of a pregnant woman, most of us would refuse.

We have developed slowly in this scientific field. We have never paused long enough to inquire why we have three and a half and twelve pound babies, why women with a negative Wassermann will have many miscarriages and still births; why some babies are slow in cutting teeth, closing the fontanelles, walking, talking; why some babies develop into timid, backward school children; why some develop into children who are overweight or under weight, who crave sweets and have early decay of teeth; why we have babies with eczema; why we have sugar and fat intolerance and pyloric spasm; why we have many young girls with menstrual irregularities who in turn produce the same kind of offspring. If we would devote the same amount of time to research work in prenatal care that we devote to the study of surgery or mechanical devices, this problem would have been solved long ago and we should be breeding babies true to our intentions as we breed hogs, cattle, sheep and what not. If a full term baby weighs five or twelve pounds at birth, some one has blundered. If she consulted us the first month of gestation, how much of that blunder is ours? It makes but a financial difference if a pig is born below par, but it makes physical, mental and moral difference if a baby is born below par. Magazine articles, government leaflets, maternity centers, and public health nurses have done much to interest mothers in seeking advice. The vast majority of mothers out of reach of these are the ones who receive no care at all. The fault lies with the family physician. A few minutes of his time each day would educate his clientele in a short time to seek prenatal care; but if he gave his patients the average prenatal care, their enthusiasm would not be justified.

What is the sum total of the average prenatal care? It is this: "when did you miss your periods? When do you expect to be confined? Do not eat too much, keep your bowels open. Take plenty of exercise, send me a sample of your urine occasionally and call me when labor begins." I am ashamed to admit that I at one time was guilty of this kind and amount of advice. I am devoting the remainder of my life to correcting my mistakes and making amends for my failures. An army with no training except to load a gun would be just as well equipped for battle as a woman for motherhood with this kind of advice.

The first step in prenatal care is a complete physical examination of the patient, including the family history. Nothing short of this gives one a working basis upon which to build a successful care. The family history of the mother is as important as the physical examination. If life insurance companies want to know this before they will gamble with us on how long we will live, we ought to know it in preparing that life that is to be. This history should include, if possible, whether or not the mother was a breast fed baby, and if a breast fed or bottle baby, was there difficulty in feeding and what food was used; what was her weight at birth; at what age did she cut her first tooth and did her milk teeth decay early; was she a fat or thin baby; was she under or over weight as a child; at what age did she menstruate and was it regular or painful; how many days duration; what was her weight at marriage and if there have been previous pregnancies did she gain in weight after the first and how much; has she headaches, eczema, pains between her shoulders or a tired feeling in the back of the neck, white spots on her finger nails; does she bite her finger nails; if previous pregnancies, the weight of each baby and its progress in development; how many brothers and sisters and the weight of each; any mental worries and the cause. Mental worries aggravate endocrin imbalance. Any information along these lines will aid greatly in the

knowledge of how many defects to expect in the baby from inheritance. Rarely two babies in the same family will receive the same expression of endocrin dysfunction. The defectiveness will select the teeth in one, the bones in another, or the skin, intestinal or respiratory tract in others and may pass over these and in adult life select the ovaries. This erratic selection of organs makes us slow in our determination of the causes of these expressions. One can not correct all the defects in one baby, but by persistent prenatal care along these lines he can do it in succeeding generations. This is eugenics in a classical way.

PHYSICAL EXAMINATION

Time will not permit me to present prenatal care in detail, so I shall mention a few things, insignificant as they may seem, that will give a fund of information if followed up.

Head.—A careful examination should be made of the tonsils and all sinuses to determine how much infection there is to tax the kidneys in the elimination of toxins, and the patient should be taught to avoid any chances of respiratory infections and promptly to treat any that occur. Each attack should be followed up with salicylates to avoid as much as possible joint and nerve infections.

Teeth.—The thorough inspection of the teeth is of the utmost importance; for the condition of these gives us valuable information as to whether or not the mother will give birth to a finished product. If I were allowed to examine only two things in the mother as a working basis for prenatal care, I should without hesitation select the mouth and the carbohydrate tolerance. The mouth is the better index of the two. In the examination of her teeth look for little, chalky white spots or discoloration in the enamel, the collection of tartar, the number and size of the cavities, the absence of teeth and at what age she began to lose them, the number of crowns and bridge work to determine the ability of the dentist who did the work; and last, but by no means least, have the patient close the mouth and note the occlusion. No matter how beautiful the teeth are, if the occlusion is bad, the patient is the victim of a semi-starvation and the alimentary tract is filled with poorly masticated food. This decomposes and causes toxicity and naturally affects the baby as well as the mother. This is especially true if she has had a nephritis prior to pregnancy.

What do these oral symptoms indicate? Except for a minus basal metabolic rate, we could not find a more beautiful or unfortunate expression of a borderland hypothyroidism. The severity of the expression indicates the severity of the cause. If we all had perfectly balanced thyroid and parathyroid function, dentists would be a matter of history. No mother with a borderland hypothyroidism will give birth to a well balanced baby. There are many ways in which this defect will manifest itself in the baby. This faulty tooth enamel may be the only visible defect in the mother, but in the baby the defect may be in teeth, bones, bow legs, knock knees or flat feet. It may show in the size of the baby, under five or over nine pounds at birth, difficulty in breast or bottle feeding, a tendency to easy birth injuries, sugar or fat intolerance, pyloric spasm and many other digestive disturbances, eczema, protein sensibility, or a timid, backward and nervous baby, and in puberty in an ovarian dysfunction with difficult and painful menstruation. In fact, if one were to enumerate the many different expressions of borderland hypothyroidism, he would make himself ridiculous in the eyes of his colleagues.

Nausea.—Pregnancy is a physiological process and as such should have no symptoms save the cessation of menses. If the patient is nauseated from a day to nine months, she has an endocrin dysfunction. The severity of one depends upon the severity of the other. If she is nauseated mildly or severely she will unbalance the baby to the same degree. The baby will be slow in closing the fontanelles, in cutting teeth, and upon the slightest provocation will develop rickets or scurvy. The dysfunction in these cases is thyro-ovarian, mostly thyroid. The thyroid is but a twin ovary. These women are noted for their failure in breast feeding and the babies oftentimes present quite a problem to the dietician who tries to feed them with a fixed amount of carbohydrate. With a lack of thyro-ovarian hormone there is oftentimes a demineralization and this increases the nausea. With no specific treatment to supply this hormonic and mineral deficiency, we have the long drawn out and distressing symptom of nausea. Nausea is a symptom that robs the woman of her enthusiasm for pregnancy and motherhood, and its cause discounts the baby's physical chances.

Weight.—If a pregnant woman is 25 to 30 per cent under or overweight, she is the victim of an endocrin dysfunction, usually thyroid and in the overweight it may be and often times is a thyro-pituitary type. The combined type can be told by the deposit of fat on the thighs and

abdomen. In the underweight we should eliminate the possibility of a tuberculous infection. A pregnant woman should not gain over twenty to twenty-five pounds in weight and a gain in weight of twenty-five and over should be watched with suspicion. Some authorities claim that a gain of twenty-five pounds and over is an indication of probable eclampsia. Some women gain as much as 60 pounds during gestation. It is, in all probability, an aggravated borderline hypothyroidism. The patient should be weighed early in pregnancy as a control and twice each month thereafter, and the increase noted. A marked increase may be due to much liquor amnii with a a large baby or twins, in addition to a faulty metabolism. Faulty metabolism is certainly dangerous to both baby and mother.

Blood Pressure.—The blood pressure should be taken at the first visit as a control and after three months every two weeks. The blood pressure tells us weeks before of impending kidney complications and also tells of toxemia in any form. To have the patient send samples of urine is stepping backwards to the days prior to the blood pressure instruments. When the urine shows albumin the time for preventive medicine is long passed and we are face to face with a serious condition that we might have prevented. A rise in blood pressure to 130 or 140 persisting for several days shows toxemia. If we have good digestion and metabolism, the blood pressure will seldom rise.

Headaches.—The question of headaches is a volume in itself, but the ones we are most concerned with are those due to hypothyroidism, hypo-adrenia, hypo-ovarianism, and calcium deficit. The headaches from an enlarged pituitary gland are beyond control in pregnancy. A blood pressure of one hundred or lower shows depletion of the adrenals which may be acute or chronic. Focal infections, suppurative diseases, septicemias, frequent respiratory infections, typhoid fever and the exanthems cause depletion of the adrenals. A depleted suprarenal pregnant woman is not going to feel well during the period of low blood pressue.

Numbness and Cramps in Legs and Arms.—These are distressing symptoms, cause a lot of inconvenience and many times loss of sleep which means much to such patients. These symptoms are due to a deficient thyroid and parathyroid hormone, principally the latter. There is also a calcium deficit.

Toxemia.—Toxemia will be reduced to almost nil by proper physical examination and the use of the knowledge gained in giving advice especially as to the alimentary tract, metabolism and focal infections. The writer has had only one case of eclampsia in thirty-five years of practice and this one, a negro, had nephritis and received no care at all. She had one convulsion, which occurred after delivery, and died during the convulsion probably from a ruptured heart. She had had care with preceding babies, became indifferent with this one and lost her life as a result of her indifference.

Libido.—A perfectly normal woman should derive pleasure from the sexual act. If there is sexual frigidity, there is a thyro-pituitary dysfunction. Usually the anterior portion of the pituitary is involved. If the posterior portion is involved, the patient will have deposits of fat on the abdomen, hips and thighs. As it is thought that it is the posterior pituitary hormone that produces and controls labor, we may find short, inadequate pains and a tendency to uterine inertia. These are often cesarean section and forceps cases. This defect will stamp itself upon the baby somewhere.

Hair.—Gray hair in a woman under forty or fifty years of age, like faulty tooth enamel, is a classical expression of deficient thyroid hormone. The younger the patient the more evident it is. Excessive hair on the legs and arms is thought by some observers to be due to disorders of the adrenals and hypophysis.

We, through the ages, have been making obstetrical blunders which have caused mankind to suffer untold inconveniences, suffering and expense, and which will continue unless we educate ourselves to give the right kind of prenatal care. I have called attention to the foregoing physical defects in order to give us a working basis upon which to build a successful care which is real eugenics. Insignificant as they may seem, a study of them will give us a fund of information about the liabilities and assets of the two patients under observation. The physical examination should be as complete and comprehensive as it is possible to make. If the patient has had a renal embarrassment, or has a rising blood pressure, a renal function test should be made. This will put the physician on his guard and he will be prepared for emergencies. It will impress upon the patient the importance of cooperation.

MEDICAL TREATMENT

If possible, every pregnant woman should have her basal metabolic rate made. If it is less than plus up to six months of pregnancy, the baby will have some defects as a result. As it is impossible to take the metabolic rate in all our cases, I shall call attention to some symptoms that will be a safe guide. If a pregnant woman comes to us with premature gray hair, either few or abundant, discolored tooth enamel, tartar on the teeth with a history of frequent visits to the dentist, white, chalky spots on the enamel, many cavities or crowned teeth, inability to retain fillings, early loss of the temporary or permanent teeth, pains between the shoulders or tired feeling in the back of the neck on standing, cold, clammy hands and feet, sensitiveness to cold, inability to get rid of respiratory infections easily, frequent sneezing with watery nasal discharge, restlessness and dreaminess at night, tendency to get drowsy on sitting down, inability to concentrate the mind, rough or spotted finger nails, the craving of sweets or starches, biting the finger nails, tendency to eczema or skin eruptions, bow legs, knock knees or flat feet, capricious appetite, under or over weight to a notable degree, with excessive nausea for a short or long period, we may be assured that we have a hypothyroidism that will express itself in the baby. These cases are at once put on glycerophosphates with or without strychnin and thyroid extract from one to three grains a day. The size of the dose depends upon the severity of the condition and the length of time that the drug is to be taken. If she is seen early, I use at least one grain a day and the glycerophosphates throughout the pregnancy. If there is much cramping of legs and arms, I use extract of parathyroid, 0.1 grain, three times a day until these symptoms subside. The thyroid and parathyroid secretions cause the mother and the baby to utilize the calcium. There is less calcium drain on the mother, she maintains a better blood calcium, her teeth and bones do not suffer as much from the drain, and her metabolism is better. The baby will be a better balanced baby, will cut teeth earlier, will close its fontanelles earlier, will have better bone, will be easier to feed on breast or bottle and will have better digestion. There will be fewer cases of rickets, eczema, asthma, metabolic disturbances and other manifestations of these inherited defects. If the mother is let alone, the normal cell composition or chemistry so to speak is disturbed and we have cell starvation. This starvation makes the baby want something. It has a continued craving for that something that nature has not given it. That unbalanced condition makes the restless, crying, the thumb sucking baby. Every baby who demands the thumb or pacifier speaks an indictment against its mother and its physician. (If let alone, the baby's weight is apt to run amuck and be five or twelve pounds). If treated properly, it will be nearer the seven or eight pound mark. Large or small babies are more apt to have birth injuries than those of normal weight. A ten or twelve pound baby is poor material for safe and easy obstetrics.

Nausea and Vomiting.—As was stated previously, nausea takes away the enthusiasm of the expectant mother. Formerly we were helpless and regarded this as one of the necessary evils of pregnancy, and nausea announced to the neighbors and immediate friends that the women was pregnant. For this I use thyroid extract orally, from one to three grains daily, calcium lactate intravenously daily or every other day, and corpora lutea or ovarian extract from two to eight doses subcutaneously each day until the symptom subsides. Pure candy is a good adjuvant to the above.

Blood.—A hemoglobin test should be taken at the first visit and if it is low, iron tonics should be given along with a well balanced diet. The patient should eat plenty of vitamins; she should have the diet balanced to keep the body in a well nourished condition. Toxemia will be much less.

Headaches.—Headaches will usually subside with laxatives if they are due to intestinal toxemia. If due to hormonic and calcium starvation, they will usually subside with giving the hormone and calcium lactate. The thyroid and parathyroid are the ones usually absent.

Diet.—Most authorities think that the diet has a lot to do with the size of the baby. I think that it has no more to do with it than it has to do with the size of the mother. A fat and a thin woman may sit side by side, eat the same amount and kind of food and take the same amount of exercise, and the thin one will remain thin and the fat one will remain fat or fatter. It is not in the amount or kind of food; it is in the ability of the patient to utilize or store it up or burn it up. The same is true with babies before and after birth. A hypothyroid mother, no matter how the diet is maintained, if let alone hormonically, will have a fat or a thin baby just the same. The baby will utilize just what material it can, whether food

or lime. There is that something in the hormonic influence of the mother that guides the cell division and multiplication and the appropriation of food and lime phosphates and if this is absent or abnormal, the helpless infant will run amuck. It will be either too large or too small or defective in some way that will in after years shape its destiny.

Exercise.—It is useless to tell the active, busy housewife to take plenty of exercise. She walks and works enough in her daily routine about the house, but very few women get enough oxygen. They can not supply their babies with enough oxygen if they do not get enough for themselves. The baby has to take pot luck, so to speak, and unless the mother has enough for herself and to spare, the baby suffers. The baby has to get its oxygen second hand, through the placental circulation, and this places it on unequal footing with the mother. The patient should be instructed to sleep with her windows open all during pregnancy and spend some time in the open air. She should, if possible, have a bed to herself. Rest is essential to good health and good digestion.

Worry.—Worry has much to do with internal secretions. I instruct my patients to have the layette completed by the sixth month. Most women wait until then to begin. This is a mistake. In the last three months they should be free from worry. There is enough worry in the anticipation of the pains and accidents of childbirth, so inspire her with the confidence that she will be taken care of no matter what comes. This prevents mental shock. If there is one to whom the whole world should turn with sympathy, interest and to do honor, it is the expectant mother. To her we owe our existence and what we are.

Water.—Water is as essential to the growth and development of the baby as are food and hormones. No woman drinks enough water. She should not only be encouraged but made to drink enough. The lack of water, oxygen and good digestion may be responsible for many still births.

Time and space prevent going into the minor details of prenatal care. The care of the nipples, the skin and bowels, what to do when labor begins, when to notify the physician, what to have ready if in the home, and many other other things such as the kind of abdominal binder and the layette should be gone into with detail. This shows her that some one is interested. This inspires confidence and confidence insures success.

You who have nurses and hospitals to help you in your work are fortunate, indeed, but what of the large number of babies who are born without nurses and prenatal care and with a half-hearted and uninterested physician in attendance? The all too large maternal and infant mortality rate and the number of crippled women and babies are not evidences of high accomplishment of present day obstetrical methods. As much skill is required to conduct a woman safely through pregnancy and labor as to do a hysterectomy or gall bladder operation. The hope is in teaching the graduate student to go out and do the kind of obstetrics that he is taught to do, and not sink to the level of the methods that have obtained in the community for a generation. Until then the casualties of motherhood will remain the same.

In conclusion,

(1) Examine the patient at the first visit.

(2) Determine her defects that seem insignificant, but mean much.

(3) Prevent these defects in the baby by treating the mother.

(4) In treating the baby we treat the mother.

(5) Present to society as nearly a perfect baby as possible.

(6) Motherhood is vastly more than being pregnant and having a baby.

DISCUSSION (*Abstract*)

Dr. James R. Reinberger, Memphis, Tennessee.—As we all know, the knowledge of the role of the endocrins in disease at the present time is only in its infancy. As time goes on deeper study will be carried out. We realize that our infant mortality is too great. Statistics show that 40 per cent of all babies born die within the first year, and a large majority, probably two-thirds, die within the first month. Aside from syphilis and the prematurities due to toxemia of pregnancy we are at a loss as to the cause of death, and in the majority of cases it is purely an assumption. A study made of some of these large, so-called post-mature babies lead us to believe that there is a thyroid disturbance. If we place this type of case on thyroid extract there is an immediate drop in weight.

Dr. Taylor has stressed toxemia as a factor in weight production. We have been looking into this phase and recording our monthly weights. In a large majority of cases where there is an increase in weight there are also associated the other usual symptoms of toxemia. Under our usual treatment for toxemia there is a decrease in weight. There is also another group of cases, in which there is a tremendous gain in weight, usually associated with generalized edema. Examination of the urine reveals marked traces of albumin

without casts. There are no symptoms of toxemia. This was formally known as von Leyden's kidney of pregnancy, or more commonly as albuminuria of pregnancy. According to McElroy we now assume that this is a straight nephrosis, the cause being unknown. Again we have certain groups of cases in which the patient is short, fat and stocky. The babies are always large and usually there is an increase in weight of the mother from twenty to forty pounds.

There is no question that focal infection is a factor in the production of toxemias, and that after removing this focus there is often a clearing up of symptoms.

It is the general opinion that nausea and vomiting of pregnancy are of toxic origin. I have never seen a case of vomiting of pregnancy clear up on organotherapy. Those who improve usually get the ordinary diet and elimination treatment, and the psychic effect of the hypodermatic and oral treatment. I think Dr. Taylor is wrong in regard to this.

Dr. G. D. Royston, St. Louis, Mo.—A great majority of full term babies lost during delivery are lost because of intracranial hemorrhage. The recent work of Moore, Brodie and Manville at the University of Oregon, and of Sure at the University of Arkansas Agricultural School, would seem to indicate that a deficiency of vitamin B in the diet of the pregnant woman is an important factor in producing this condition. Moore and his co-workers in a study of 26 litters of rats found that 85 per cent of the young died from intracranial hemorrhage where the diet was normal except for a deficiency of vitamin B. Sure found that adding vitamin B to the diet of these mothers, who before labor were kept on a diet lacking this vitamin B, was not sufficient to sustain the life of the newborn, and suggested that this vitamin B should be added to the diet of the young suckling rat. He also found that postpartum hemorrhage was much more prevalent in mothers where the diet was deficient in vitamin B. We know that vitamin B can be given in green vegetables, and fruit, but an easy way is to add two cakes of yeast a day to the regular diet.

In treatment of intracranial hemorrhage of the infant after difficult delivery, we have found injection of blood a great aid immediately after birth. Some give only 10 c. c., which is inadequate. Forty to 50 c. c. of whole blood should be injected subcutaneously between the shoulders of the newborn. I think the baby who acts abnormally immediately or a few days after birth, with increased tension of the fontanelles, paralysis, or even suggested symptoms of this sort, should have a spinal puncture to limit the intracranial tension. A cisterna puncture is indicated in severe conditions when spinal puncture gives negative results. Spinal puncture has been a great aid, both in making a difficult diagnosis and also for its therapeutic value. Repeated spinal punctures should be supplemented with subcutaneous injections of whole blood.

Dr. L. A. Calkins, University, Va.—Dr. Eardley Holland, of England has recently shown that 30 per cent of stillbirths and 30 per cent of the deaths in the first two weeks after birth are due to syphilis. The importance of Wassermann examination during pregnancy cannot, therefore, be overestimated. Unfortunately a few years ago we got the impression that the Wassermann test during pregnancy was not reliable. In recent work it has, however, been shown that a repeated four-plus Wassermann during pregnancy means syphilis just as much as it does any other time. Moreover, if we obtain that positive Wassermann early in pregnancy and institute proper treatment, we can get a living baby and a reasonably healthy baby at delivery.

Dr. G. F. Douglas, Birmingham, Ala.—As Dr. Calkins suggested, I feel we are derelict in our duty if we do not have a Wassermann, wherever possible, in all cases when the patient comes the first time for examination. If we do so we will pick up many syphilitic cases and be able to give treatment which will be of material benefit.

Dr. Taylor (closing).—I wish to impress upon you the importance of treating nausea. Too many of us treat this lightly and let it go, thinking it will finally cease. I have had no failure in these cases since I have been using this treatment. As soon as a woman comes in with nausea I give her one ampoule of calcium lactate in the veins, corpora lutea under the skin as much as six ampoules a day and by mouth two to three grains of thyroid extract. The calcium is repeated daily or every other day until the nausea ceases. I sometimes use calcium chlorid in the veins, but care must be used in injecting it so that none escapes into the skin. The thyroid is kept up until nausea ceases and then I use one grain a day during pregnancy. Glycerophosphates are given, too, during pregnancy after nausea ceases. These babies will be easy to care for. They cut teeth, close the fontanelles early and have straight legs and are better babies.

I am comparing my work now with my former work and I have had ample opportunity to see the difference. Formerly obstetrics was a nightmare; now it is a pleasure.

With the thyroid extract we develop the baby better and keep its weight down to at least eight pounds. A baby under six pounds and over eight or nine pounds is more liable to birth injuries. The light weight baby is born easier, but is under developed and can not stand punishment. I know that some physicians say that diet controls the size of the baby. In my hands it has been an absolute failure. Since I have been using this method I have not had a baby under seven or over eight and a half pounds, if I have had care of the mother for at least seven months before birth.

EXPOSURE OF THE BLADDER PRIOR TO CYSTOSTOMY OR SUPRAPUBIC PROSTATECTOMY*†

By JOHN H. NEFF, M.D.,
University, Va.

In the *Annals of Surgery* for June, 1916, Williams, of London, Canada, described a two-stage cystostomy and strongly advocated its use in the poor-risk prostatic and the average patient with vesical calculus. The aim of his technic was to prevent gross infection of the suprapubic

*Read in Section on Urology, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†From the Department of Urology, University of Virginia.

wound with the attendant dangers and discomforts. His method, in a few words, was to expose the bladder in the usual manner, place stay sutures in the bladder wall, pack the wound open with gauze and enter the bladder some four to seven days later. After this interval it was found that an aseptic inflammatory reaction had matted together the component layers of the abdominal wall, sealed off the paravesical tissues and converted the wound into a cleanly granulating trough, the net result being an effective barrier against a dissecting infection.

His own satisfaction with the procedure, after a twelve months' trial, he then expressed as follows:

"During the after-treatment the skin remains normal in color without the least sign of induration. There is no pain around the edges of the opening and the general appearance of the wound is all that could be desired. In fact, other conditions being equal, a rapid normal healing takes place, with delayed union and primary fistula brought to a minimum. The comfort of these patients is a marked contrast to the discomfort experienced after the immediate cystostomy previously performed, which often left a dusky infiltration of skin, sloughing tissues and all the dangers of thrombosis and sepsis. . . . . For suprapubic prostatectomy, in the worst forms of infected bladder, the 'three-stage' operation is now always performed. For vesical calculus this method is ideal. . . . . All cases of stone are now treated in this manner with the exception of those patients whose urine is in the best possible condition."

The principle underlying this "two-stage" cystostomy is, of course, one not infrequently utilized in general surgery. The preliminary exposure of the larynx or esophagus to lessen the likelihood of mediastinitis upon opening these structures has the same rationale. Its application to surgery of the bladder and prostate, however, I have never seen mentioned elsewhere. Dr. Williams writes me that he knows of no other literature on the subject. He states that the procedure is now constantly used in his own clinic at the University of Western Ontario, and frequently employed by the surgeons of his vicinity and in the West. No doubt he means by "West" western Canada. My happy experience with the method in some forty patients during the past ten years leads me to feel that it deserves a more general use than it apparently has enjoyed.

During the early years of my employment of the preliminary exposure I limited its use to the type of patient for whom it was mainly advised by Williams, namely, the bad-risk prostatic, or the one with an unusually foul cystitis. The first group of patients was a small one. The age of the majority averaged eighty and the urine in every instance had a four-plus pus content. The wounds uniformly showed an absence of induration, tenderness or slough, and, in the cases surviving prostatectomy, there was no undue delay in fistula healing.

As time went on I found myself employing the method with increasing frequency, and even in the best risk prostatics. An occasional rather severe wound infection after the ordinary cystostomy or one-stage prostatectomy gradually developed in me a cumulative regard for Williams' technic as the surest guarantee against these complications. A really terrible infection some twelve months ago has led me to adopt the procedure almost routinely.

From the start the operative sequence in my hands has differed, more often than not, from that outlined by Williams because of the twenty-year custom at our clinic of securing pre-operative drainage in the large majority of prostatics by an indwelling catheter. In cases adequately prepared for operation by this means the exposure has been made and the prostate removed four or five days later without the intermediate step of a cystostomy. As a rule, the "three-stage" prostatectomy has been done only in those patients for whom a permanent catheter was contra-indicated, or for whom prolonged preparatory drainage was required. In a few, the three stages were utilized in spite of satisfactory catheter preparation because four or more days after the exposure the patient for one reason or another proved to be not quite ready for prostatectomy.

I have been unable to achieve the enviable results reported by some writers who state that they have never had more than a superficial wound infection after either step of the orthodox two-stage prostatectomy. No matter what preventive tricks I have tried, about 20 per cent of my one-stage prostatectomies or cystostomies have shown infection to the extent of more or less fascial sloughing. The frequency has naturally been higher for the former than the latter. But for both groups there has occurred now and then sufficient breaking down of the wound to prolong convalescence very materially, occasionally almost to the point of wearing out patient and physician.

A favorable contrast has been afforded where the preliminary exposure has been used. In every instance so far there has been no brawny

induration about the wound, no discoloration of the skin, no sloughing of fascia, and a notable absence of pain. A comparison of two unselected series of twenty-five prostatectomies handled essentially alike save for the employment or non-employment of preliminary exposure, shows that the average time of fistula healing has been decidedly lower in the exposure series, and that there have been 10 per cent more closures in three weeks or less. An interesting sidelight on the exposure technic has been the readiness with which successive house officers have taken to it after having had the tedious care of some badly infected wounds.

My technic for the exposure has been practically identical with that described by Williams. The well filled bladder is approached under local anesthesia. The peritoneum and fat are dissected away from the bladder with a knife rather than stripped back with gauze. Three silk guy sutures are placed in the bladder wall, one just below the peritoneal reflection and one to each side of the midline at a lower level. In placing the gauze pack care is taken to fill the wound snugly and particularly to hold the peritoneal apron well up and away from the bladder wall. The guy sutures are tied over the pack and the wound flooded then, and daily thereafter, with mercurochrome solution. The wound is strapped with adhesive, both to support the abdominal wall and to prevent possible extrusion of the gauze. There is practically no reaction after the exposure and rarely any need to interrupt the usual routine of the patient save for bed confinement. The same freedom from any significant discomfort is constantly observed if a later cystostomy is done.

After the removal of the gauze pack the tissues are quite friable and without their normal elasticity. This may be classed as a disadvantage, yet no damage will be done if tissue handling be gentle. Such an obligation is not an undesirable one for the operator to impose upon himself. The guy sutures exactly locate the point for opening the bladder. The steps to complete the cystostomy or prostatectomy require no further description other than to say that the wound is closed rather loosely in either operation and approximation is maintained in considerable degree by adhesive strapping.

In conclusion, I would merely reiterate my belief that Williams' technic has real merit in prostatic and bladder surgery. In my hands it has secured a very decided alleviation of wound morbidity whether applied to the prostatectomy or lithotomy problem. I further feel that it has probably contributed to a lowering of prostatectomy mortality. During the past thirty-two months it has been my good fortune to have a consecutive series of seventy-six suprapubic prostatectomies with one death. The preliminary exposure was used in approximately 50 per cent of these cases.

DISCUSSION (*Abstract*)

Dr. Clinton K. Smith, Kansas City, Mo.—The problem seems to resolve itself into whether the extra confinement of the patient to bed overshadows the benefits derived. If it is used at all, it should probably be used routinely, inasmuch as some of the most troublesome sloughing of the belly wall has occurred in my cases in which, apparently, the bladder was normally free of infection before operation, rather than in the cases in which there was definite, well-established pre-operative bladder infection.

This complication has usually occurred following one-stage prostatectomy, where the patient was prepared on the indwelling catheter, which is my method of choice unless contraindicated, and where, apparently, there was not an established bladder infection. It occurs to me that infection developing incident to the retention catheter may have something to do with the catheter.

I believe that bringing the bladder snugly up against the abdominal wall after it is opened is of advantage in limiting the spread of infection. It is my practice to pass a silk-worm gut suture through the abdominal wall from without inward, passing through the upper aspect of the bladder and out through the abdominal wall on the opposite side. A similar suture is passed through the lower aspect of the bladder, and after the abdominal closure has been made these sutures are drawn taut, which brings the bladder snugly up against the abdominal wall, both above and below. I have had less trouble with this complication since adopting the above plan of closure.

Dr. O. S. McCown, Memphis, Tenn.—My method of doing cystostomy as a preliminary to prostatectomy has for a long time been to expose the bladder, make a puncture in the bladder wall and insert a snug-fitting large-sized Pezzar catheter. I believe this method is advocated by Dr. Boyd also. The cases handled in this way have been relatively free from wound infection and have done well. The plan of exposing the bladder and packing the wound, and waiting several days before opening the bladder, as suggested by Williams and as practiced by Dr. Neff, is but making a new use of a very old principle which has proven of great value in many other difficult surgical conditions, among which may be mentioned abscess of the lung, abscess of the liver, and malignant disease of the bowel which requires resection. Dr. Neff's results show that the application of the principle to cystostomy is a distinct advance in surgery of the bladder and prostate. It should eliminate the infection of the abdominal wound which is often troublesome, and occasionally causes the loss of a patient. I can think of only one class of patients in whom it cannot be used to advantage. Fortunately, this class is small and growing smaller, as physicians in general are handling prostatic patients

better. I have in mind those patients who come to us with complete retention and in whom nothing can be passed through the urethra. Usually in these cases the urethra has been torn and the prostate traumatized by unsuccessful attempts at the passage of a metal catheter or metal sounds. These can be handled by the plan I have been using as well as by any other.

Dr. W. H. Toulson, Baltimore, Md.—We all try to prepare the bladders properly before prostatectomy with indwelling catheters, but many cases cannot be drained properly with indwelling catheters, and with these patients we almost certainly have to use the two-stage operation. Dr. Neff has drawn attention to a very important factor in this particular type of case. There are one or two things that are not quite clear to me. It seems to me that if the bladder is thin-walled, one is likely to tear it by putting in sutures. Second, in certain individuals whose peritoneum rolls down toward the suprapubic bone, is it not possible that this intra-abdominal pressure will push the peritoneum back again against the sutures?

Dr. J. H. Smith, Memphis, Tenn.—Dr. Neff does not advocate this method in acute obstructive hypertrophy of the prostate. There is no haste in the majority of cases about removing the prostate.

The urologists are largely responsible for the patience shown in preparing these cases. We are responsible for taking more time in the chronic surgical conditions and bringing the patient up to the best state possible before attempting any operation. Dr. Crile, with his work on anoci-association, has helped largely to educate the profession to the advantage of preparing the patient for operation. Dr. Neff's method is similar to Dr. Crile's method of doing a thyroidectomy. As you know, he takes his patients to the operating room and gets them accustomed to the situation. Dr. Neff's plan is somewhat similar.

Dr. Folsom, in his discussion of a previous paper, explained the method I use in freeing the bladder down to the ureter, making it a pendulous sac, bringing it up and taking a guy suture in the anterior surface, pushing the parietal peritoneum up with gauze, making a high incision into the bladder, using a purse-string suture, and inserting a large drainage tube. I have had very satisfactory results with this method. I have not used Dr. Neff's method.

Dr. C. A. Sheely, Gulfport, Miss.—In doing a cystotomy, a technic which is certain and in which the least possible traumatism is done, is the best. Instead of opening wide the space of Retzius, it is better to go down to and identify the peritoneum and follow this down to and identify and open the bladder. If, by accident, the peritoneum is opened, take advantage of this accident and go on down and identify the bladder; close the peritoneum very thoroughly, and then open the bladder. Even the risk of opening the peritoneum is less hazardous than to open widely the space of Retzius. It is better to follow the peritoneum down to the bladder.

Dr. Bransford Lewis, St. Louis, Mo.—I was impressed with the procedure Dr. Neff described in 1916 and used it two or three times, but did not continue it, for I thought it added nothing to a procedure of two-stage prostatectomy.

We do catheter drainage one week or seven, it makes no difference, until we are ready to do the first stage. Under local anesthesia we go down to the bladder, never using a knife after we have passed the muscles, but using blunt dissection, and apply a suture which holds the peritoneum well up out of reach, another down below, and perhaps a third. We do that at one time. What is the use of waiting eight days for further drainage, for the agglutination of the abdominal wall to the bladder wall? You do not have to wait, for you cause the application of the bladder wall to the inner abdominal wall immediately, and you do the further drainage through an angle catheter, and by that time you are ready to take the prostate out. It strikes me that this is an expenditure of eight days without any decided advantage.

Dr. Marion H. Wyman, Columbia, S. C.—We might accept this as the fourth stage of prostatectomy. First, the depressive, which may take several days; then Dr. Neff's operation, and then expose to the bladder as described. After the bladder is decompressed for a few days we can make a stab under novocain and get the lavage, and after the blood test has been made, the phthalein estimation and so forth, we can do the rest of the operation.

If you do the thing in one stage, put the drainage tube into the bladder and then put in the sutures, you get a lavage of the infected material. The advantage of the method described is that you have a perfectly clean wound and the bladder up, and each stage is a progressive one.

Dr. Edward L. Keyes, New York, N. Y.—I should like to know Dr. Neff's results; also, how high he cuts the bladder wall, whether the bag remains in during the drainage, and how many days of preliminary drainage he gives before the bladder is opened. Likewise, what is the percentage of hernia?

My sentiment would be against Dr. Neff's plan, but it is an interesting suggestion for the big stone cases, which are apt to develop cellulitis and die. I have tried in two ways to avoid this. In the last five or six years I have twice done the intraperitoneal cystostomy, Harrington's operation, successfully. The other way has been to do a suprapubic cystostomy and take the stone out. The bladder may then be closed without drainage, and should be unless there is something to drain.

Dr. Neff (closing).—Preliminary exposure, before either cystostomy or prostatectomy, increases bed confinement only by the period of exposure, usually four days. After the cystostomy or prostatectomy, the patient can be handled exactly as he would have been had the exposure not been done. While it is not entirely pertinent, I may add that I have never been impressed with the wisdom of routinely forcing these old men out of bed soon after operation. One's practice in this regard, it seems to me, should be determined by the systemic and local condition of each patient.

My paper originally contained a paragraph concerning the effect of the exposure technic on the frequency of post-operative hernia. But many of my cases were too recent to permit a fair comparison. Follow-up statistics so far have shown no greater frequency of hernia. On theoretical grounds, I would expect hernia to be less frequent because of the relatively kindlier and more rapid healing of the wounds.

My use of this technic was quite sporadic for a number of years. I was led to give it a really thorough trial after a few bad infections which I thought its use might have prevented. This experiment convinced me that the method had very real value, nota-

bly for the badly infected or poor risk case. At present I am using it routinely in all suprapubic prostatectomies and lithotomies and plan at some later time to report results for a larger case series.

RADIUM TREATMENT OF NASOPHARYNGEAL FIBROMATA*

By PAUL S. MERTINS, M.D., F.A.C.S.,
Montgomery, Ala.

Nasopharyngeal fibromata are among the rare growths encountered by the rhinologist, and there are many with extensive experience who have never seen a case in private practice. Fibromata occur in the majority of cases between the ages of ten and twenty-five years. They are more often single, but rare cases of multiple fibromata have been reported.[1] Fibromata are found almost exclusively in the young male, rarely in the female.

Fibromata may have their origin from any part of the naso-pharynx but the spheno-ethmoid angle and the anterior surface of the base of the occipital bone seem to be the points of election. Usually the further forward the growth takes its origin and extends, the softer and more cellular it becomes.[2] The more cellular the tumor the greater the probability of recurrence after operation. Fibromata may be pedunculated or sessile and from pressure may cause destruction of the neighboring tissues, even bone yielding to its rapid growth. As a result of inflammation, they may form adhesions with surrounding tissues.

Fibromata vary greatly in size, and do not metastasize or involve neighboring glands. From their rapid growth, from their tendency to recur after removal, from their tendency to severe and recurring hemorrhages and their destructive action on surrounding tissues, they may be regarded clinically as malignant.

Symptoms of nasopharyngeal fibromata are the result of obstruction and pressure. According to location and size they may cause partial or complete obstruction to nasal respiration, and may press on any of the surrounding tissues causing pain and atrophy. Fibromata may cause deafness and otalgia by obstructing the eustachian tube, and may invade any or all of the accessory sinuses. Exophthalmos, atrophy and diplopia may be the result of pressure, and even the cranial cavity may be invaded. When large they may extend into the oropharynx. Hemorrhage of a violent and recurrent type is characteristic.

The operative history of nasopharyngeal fibromata forms one of the darkest and most dramatic chapters in rhinology. We admire the courage and genius of our confreres of the past, though the results which attended their surgical efforts were in a large per cent of the cases disastrous. Moure's lateral rhinostomy, Ollier's, Rouge's and Langenbeck's operations, splitting of the soft palate, resection of the hard palate, ligation of the carotids and tracheotomy were some of the preliminary operations attending their efforts at removal of the growth. Sepsis, pneumonia, hemorrhage and shock took a large toll of those who through necessity submitted to surgical interference. The cold snare, electro-cautery snare, electro-cautery, chisel and forceps were some of the methods employed.

"Out of 58 cases collected and reported by Lincoln, 38 were removed by severe operations and only ten of these were cured, fourteen cases were operated upon by the galvano-cautery snare and of these eleven were cured and three relapsed. One-third of the cases succumbed to pneumonia, one-third died from immediate consequences of pneumonia and sepsis, and one-third escaped death after long and complicated runs of septicemia."[3]

Nasopharyngeal fibromata are so rare that we are justified in reporting each case with the operative measures employed.

In this country Gordon B. New and Fred Figi,[4] have reported more cases than any other men of recent time. It has been my rare privilege to have had two cases of nasopharyngeal fibroma within the last year. So satisfactory have been the results in these cases from the method of treatment employed that I am placing them on record, that the results may be added to the other cases in which radium has been successfully used.

Case 1.—Ellis E., twenty-two years of age, was seen Jan. 14, 1926 with Dr. F. P. Boswell, radiologist, to whom the case had been referred. His chief complaint was of obstructed nasal respiration, severe and recurrent nasal hemorrhage. Mr. E. had never had a severe illness, and his family history was devoid of interest. He first noticed trouble with the nose in 1922, and took advertised treatment for catarrh of the head and nose until 1925 without benefit. In February, 1925 he had such a severe hemorrhage that he consulted a rhinologist who diagnosed the condition, as due to a polypus, said he could remove it, and performed an operation. Following the operation the tumor enlarged more rapidly than before. Toward the end of the year the rhinologist made another operation for removal of the growth and failed. Mr. E. then consulted Dr. Coleman, of Dothan, who made a diagnosis of naso-

*Read in Section on Eye, Ear, Nose and Throat, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

pharyngeal fibroma, and referred the case to Dr. Boswell for treatment.

Physical examination showed a well developed, and well nourished anemic young man. There was slight exophthalmos of the right eye. Examination of the right nasal passage showed a large firm reddish tumor filling the posterior half of the nasal cavity. It was bound by adhesions to the septum and turbinates and apparently originated in the ethmo-sphenoid angle by a broad base. The left nasal passage was nearly closed, the septum having been pushed over to the left. A small rubber catheter could be passed with difficulty under the inferior turbinates on both sides. From the mouth the soft palate bulged down and forward on the right side, and in the naso-pharynx a firm round reddish mass the size of a hen egg could be seen. Examination of the tumor with a probe started a brisk hemorrhage which was easily controlled.

Diagnosis of nasopharyngeal fibroma was made, and treatment with radium was advised. Under direction of Dr. Boswell as to dosage, radium needles were inserted in the tumor mass from both the nasal and the nasopharyngeal sides. An initial radium dose of 1122 mg. hours was given January 14, 1926. The needles were threaded with dental floss, which is exceptionally strong, and the ends of the dental floss were brought out through the nose and fastened on the cheek with adhesive.

February 16, 1926, there was noted marked shrinking in size of the tumor, and some respiration through both nasal passages. There had been no recurrence of hemorrhages. On this date a dose of radium of 850 mg. hours was given with needles inserted in the tumor mass through the right nasal passage. On June 14, 1926, there was still some sloughing of the upper portion of the tumor mass, and respiration was much clearer. A third and last dose of radium of 850 mg. hours was given by inserting needles in the tumor base.

On examination December 7, 1926, no trace of tumor could be found, the right nasal passage was large, and the posterior half of the septum was pushed over the left side. A rather thick dry tenacious mucus covered the nasopharynx. The patient was ruddy, had gained in weight and strength, and had had no more hemorrhages.

Case 2.—A negro male, 19 years of age, had a firm tumor mass on the right lateral naso and oropharyngeal wall, the size of half a lemon. The growth was of several months duration. There had been no hemorrhage, pain or involvement of lymph glands. The chief complaint was of obstructed respiration, and difficulty in deglutition, and speech. The Wassermann was negative. An initial dose of radium of 300 mg. hours was given by inserting radium needles into the tumor mass, bringing the dental floss with which they were threaded out of the nose and on to the cheek. No hemorrhage occurred on removal of the needles. At the end of ten days there was some sloughing of the tumor, with some hemorrhage; a heavy clot covered the slough and extended over to the tonsil on the opposite side. A slow oozing continued for about a week, being controlled by frequent use of iced gargle. The clot was slowly thrown off leaving a deep ulcerated surface. Within six weeks the throat was healed and there was no evidence of a tumor present. By a smaller dose of radium the sloughing and hemorrhage would probably have been avoided.

The use of radium in the form of needles seems to be the best method of application. The action of the radium needles is limited to the tumor mass, and the dosage is more accurate than when tubes were used. When radium has been employed in tubes without proper screening the surrounding tissues have at times been involved. New and Figi report two of three earlier cases with perforation of the soft palate where the tubes had been used.[4] Radium in the form of emanation seeds is probably the most accurate and elegant method of applying radium, but is the most expensive method.

Radium has greatly simplified the treatment of nasopharyngeal fibromata. The inaccessibility of the tumor location has been overcome, the operative mortality has been reduced to nothing, and the mutilating operations of the past have been made almost unnecessary. In cases where operation may be later required the preliminary use of radium reduces the amount of hemorrhage and lessens the danger of the operation. Fifty mg. hours of radium is the average dose to be used for each cubic centimeter of tumor tissue. The use of radium has revolutionized the treatment of nasopharyngeal fibromata and is today the method promising the best results.

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DISCUSSION (*Abstract*)

Dr. Richmond McKinney, Memphis, Tenn.—I have treated some fibromata of the nasopharynx, but did little with them. When they are pedunculated, I use a cold wire snare. If they are sessile, they should be handled by a general surgeon. In the pedunculated type I have had no trouble in snaring them off, and I have not noticed a tendency to recur. As the sessile type grows, the bones of the face may be spread, and there is a bulging of the eyes from pressure. Radium should be successful there, if surgery is not successful. In Memphis we have used radium in sarcomata with some success, and if it can be used there, it ought to be successful in fibroma.

Dr. Monte F. Meyer, New Orleans, La.—Recently I had a white male patient, age 29, with a tumor mass filling the entire right nasal cavity. Section from this examined microscopically, proved to be a nasal fibroma. Four radium seeds of a millicurie each were inserted into the mass. He returned to me in about two months and the mass had grown instead of being reduced.

About the same time my associate, Dr. Fuchs, had a

similar case in a white male, age 42. He was able to remove part of it surgically and in the remainder of the tumor which extended into the nasopharynx, he inserted radium needles as the essayist has advised. Four 25 mg. needles, two in the nasal portion and the other two in the pharyngeal were left in for a period of 12 hours. After six weeks, the mass had begun to shrink considerably. In three months there was hardly a vestige, and there has been no recurrence to date.

Dr. John H. Foster, Houston, Texas.—We have two distinct types of naso-pharyngeal fibromata. The first is usually well pedunculated, often as firm as the other form, can be removed with a snare and does not have a tendency to bleed excessively or to recur. The second form is the true naso-pharyngeal fibroma with which Dr. Mertins deals in this paper. These latter are locally malignant in that there is a marked tendency to recur. The broad nature of their attachment makes removal with a snare impractical and the excessive bleeding caused by operative procedures makes their surgical removal a formidable undertaking. Until the advent of radium treatment they were very difficult to handle.

I have removed many pedunculated fibromata, but in private practice have had only two of the malignant type. One of these was cured with radium and the other is now under treatment and is improving rapidly.

Dr. Edward A. Looper, Baltimore, Md.—Three years ago I had a case of pedunculated fibroma extending into the nasopharynx. On account of the tendency of such cases to bleed profusely following any operative procedure, we decided to use radium needle applications. This worked admiringly and the growth disappeared after a few treatments.

Dr. Mertins (closing).— At the Mayo Clinic, of 24 cases of fibroma of the nasopharynx in which radium was used, 15 have been cured; 4 are still under treatment; 4 they have been unable to trace; 1 case was not treated at all following examination. It is noteworthy that 15 out of 24 cases have been cured.

PELLAGRA*

By W. A. DEARMAN, M.D.,
Gulfport, Miss.

The word pellagra is derived from a Latin and a Greek word, meaning to seize the skin, and while the gastro-intestinal and neuro-psychiatric symptomatology is outstanding, a diagnosis of the disease cannot be made with certainty unless the typical cutaneous manifestations are present. Although much research work has been done in trying to find the specific cause, little information has been adduced except that an unbalanced diet plays the most important role. This underlying etiologic factor is accepted and adhered to by almost all clinicians. The term pellagra is beginning to become uninteresting, however, I shall review some of the more important steps that have been taken to prevent the disease in certain sections of the country; and to cure the malady when once established. Some have been misinformed as to the prevalence of the disease in the South.

Reliable and accurate statistical data would indicate that pellagra in the South is not on the increase, particularly in Mississippi. Some may be obsessed with pellagraphobia in, and outside, of the flooded area, and it may be stated reliably and scientifically that there is no need to fear an outbreak of the disease in this area. The phenomenal advances of the South in recent years, in education, good roads, public health administration, agriculture, dairying and many other varied enterprises would tend to advance our civilization toward a higher plane of living and well-being, and would offer a solution for a more scientific prevention and control of the disease.

To be more accurate, a brief statistical tabulation of the number of cases of pellagra, white and black, in Mississippi, alone for the years 1914 to 1926 inclusive, will be interesting and will form a basis for a more intelligent study and understanding of this loathesome malady.

STATISTICAL TABLE

Year:	Cases Total	Cases White	Cases Black	Deaths Total	Deaths White	Deaths Black
1914	10,954	3,963	6,991	1,192	256	936
1915	15,831	5,558	10,273	1,535	275	1,260
1916	7,707	2,585	5,122	840	165	675
1917	11,635	4,655	6,980	1,086	212	874
1918	8,340	3,016	5,324	746	137	609
1919	5,856	1,913	3,943	495	109	386
1920	5,887	1,642	4,245	554	100	454
1921	9,902	1,970	7,932	684	82	602
1922	6,057	1,677	4,380	448	75	373
1923	5,048	1,520	3,528	413	88	325
1924	5,896	1,763	4,133	413	70	343
1925	8,646	2,612	6,034	561	87	474
1926	7,393	2,363	5,030	564	104	460

The above table would indicate that the proportion of cases occurring in the negro race as compared to the white population, is approximately two to one, and the proportion of deaths, approximately four to one. The lack of intelligence and the bad hygienic surroundings in a large measure account for the higher morbidity and mortality in the negro population. From January to September of this year 9,948 cases of pellagra have been reported in Mississippi. In some of the Delta counties there has been a

*Read in Section on Gastro-Enterology, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

slight increase in the number of cases; beginning in March and including August. After July there was a sharp decline, and during the month of September, the number of cases reported was almost negligible, except in Washington County, which reported 286 cases in this month. Bolivar County had only 75 cases in September, while the highest peak was reached in July, of 254 cases. Sunflower, Coahoma, Humphries, Issaquena, Leflore and Sharkey Counties had only a very moderate increase during the year. In Yazoo County the disease was almost negligible. The marked decrease in pellagra incidence in September, would be a strong indication, that no further trouble should be anticipated.

TREATMENT

The treatment of pellagra is preventive, curative, and palliative, the palliative treatment being reserved for the morbibund or those advanced and neglected cases, where marked cerebro-spinal symptoms are present. After carefully reviewing all the literature relative to the numerous dietetic experiments which have been conducted over long periods of time, especially with carrots, rutabagas, tomatoes, casein and many others, including the legumes, the conclusion is inevitably reached that the liberal consumption of fresh wholesome milk, lean meats, such as steak, pork and chicken, with an abundance of fresh green leafy vegetables, fruits, cereals, cream and fresh yard eggs, is the *sine qua non* in the prevention and cure of the disease; dried brewer's yeast coming as the last suggestion toward supplying an unknown quantity, known as factor P. P. or an anti-pellagrous vitamin. It may be that a closer, a more intensive, and scientific study of the character of certain vitamins may be helpful in solving the problems of etiology and therapy. In the prevention and treatment of pellagra it is interesting to know that a severe case of hookworm disease in the writer's experience, showing all the cutaneous, gastro-intestinal, and neurological signs of pellagra, cleared up completely following the administration of oil of chenopodium, with no dietetic regimen entering into the therapy. Another well-developed case of pellagra came in with the history that he was drinking on an average of one-half gallon of rye shinny a day. He was admonished to abstain from the moonshine, and with no other dietetic change he completely recovered in three weeks. A return to his former habit promptly brought about a recurrence of his pellagrous state.

Since the program has been announced I have had several letters and reprints from prominent physicians, especially, from North and South Carolina, telling me of their experience with the disease. They advise that the prevention and cure of pellagra consists in drinking an abundance of fresh milk. One of the physicians, a member of the State Board of Medical Examiners sums up the treatment in the following paragraph:

"In the bright hereafter when all the benefits and all the beneficial agents of all the ages are gathered up and condensed into globules of transcendent ecstacy, I doubt whether there will be anything half so beneficial to the human race from the cradle to the grave, as the grand old Jersey cow, America's greatest asset."

DISCUSSION (*Abstract*)

Dr. Joseph Goldberger, U. S. P. H. S., Washington, D. C.—I can perhaps utilize to the best advantage the brief time allotted for discussion of this paper by telling you something of the newer results which my associates and I have obtained in our study of pellagra.

We believe that the dog is a suitable experimental animal for the study of pellagra. We can experimentally induce in this animal a condition which in certain important features is strikingly like the human disease. We can do this at pleasure by feeding a diet of the type commonly associated with the occurrence of pellagra in the human being. This experimental condition in the dog is believed to be identical with that which occurs spontaneously in that animal and is commonly known as black tongue.

The condition in the dog is experimentally induced by feeding a diet of the type commonly associated with the human disease. We have found furthermore that, so far as tested, the foods which prevent the occurrence of the disease in the dog also prevent the disease in the human and, conversely, the foods that are feeble as preventives of the human disease are feeble preventives, or fail to prevent the disease in the dog.

We think it very probable also that we can experimentally induce in the albino rat, by feeding, a pathological condition analogous to human pellagra. The pathological condition in the rat is characterized by erosions of the angles of the mouth, ulceration of the tongue, and a dermatitis which may affect the ears, the backs of the fore paws, the backs of the hind paws, or some combination of these sites.

Our investigations have led us to the conclusion that the primary dietary defect related to pellagra is a deficiency in a factor which my associates and I have for convenience designated as factor P. P., or the pellagra-preventive. We have found furthermore that this factor has heretofore very probably been included with the beriberi-preventive under the designation water soluble B. So far as our work has gone it suggests that factor P. P. is to be found in, among others, those foods which are known to contain the so-called vitamin B. Direct tests have shown it to be present in beef muscle, wheat germ, tomatoes, cowpeas, and yeast. Yeast appears to be particularly rich in this factor, and in the form of the dried, powdered yeast or as a yeast extract has been found very efficient in the treatment and prevention of pellagra.

Dr. Seale Harris, Birmingham, Ala.—In 1902-03 pellagra was prevalent in the Canal Zone and Dr. Deeks, who was then Physician-in-Chief of Ancon Hospital, under General Gorgas, in a paper which was published, I think, in the *Medical Record* about 1904 announced that he believed pellagra was due to a high carbohydrate diet, particularly one in which there was a predominance of cane sugar. I shall ask Dr. Deeks, now Medical Director of the United Fruit Company, to discuss this paper.

Dr. W. E. Deeks, New York, N. Y.—I became interested in this subject in the Canal Zone, and reported in 1908, some 20 cases of pellagra which we treated in Ancon Hospital.

Dr. Dearman states that dermatitis is always present in these cases. I think that about 10 per cent of our Canal Zone cases had all the symptoms of pellagra except the dermatitis. We called them masked pellagra.

I stated at that time that pellagra was a dietetic disease. I had noticed the relationship of excess intake of cane sugar in the production of hyperchlorhydria, heartburn and other symptoms of acute and chronic indigestion. On that premise I began to treat my cases. I eliminated sugar in every form from their diet, and by reducing the carbohydrate intake, and insisting on an abundance of green vegetables, legumes, and fresh fruits, my results, with the exception of two cases, were spectacular. In those cases that developed dementia, although we were able to clear up the physical symptoms satisfactorily, the mental symptoms never entirely disappeared.

In women, vaginitis occurred as often as stomatitis. In the latter condition there was oftentimes a white membrane, sometimes gangrenous in appearance, that gathered on the edges and along the under surface of the tongue, and inner surface of the gums. The class of cases in which I failed were those that were admitted to the hospital in practically moribund condition, who had some secondary infection in addition to their pellagrous symptoms. Such advanced cases would usually live not more than three or four days after admission.

My method of treatment was to give an abundance of orange juice at the beginning; then add milk to the diet; shortly after, to allow the patient fresh meats, eggs, legumes, fresh leafy and root vegetables. Later, bread and potatoes were added gradually, but were limited in quantity. Previous to that time I had always understood that corn was the main etiological factor. As a matter of fact, I knew that most of my pellagra cases were not on a corn diet, but that they lived on a diet which was very rich in sweet and starchy food. The diet I have described is still used in all our hospitals and our results are always favorable.

I believe that one of the greatest factors in producing pellagra, particularly the irritable tongue, and the indigestion and diarrhea, is the excessive consumption of cane sugar, which is the most fermentable carbohydrate that we know, and which causes more digestive disturbance, in my opinion, than any other class of food. The excessive consumption of sugar is frequently the cause of such conditions as bed-wetting by children, dysmenorrhea in girls, and a series of other conditions that are daily encountered in general practice. They are not relieved by the usual remedies prescribed, but are usually relieved by placing the patient on a properly balanced diet.

Dr. Hugh A. Greenwood, Maracaibo, Venezuela, S. A.—I will simply reiterate what Dr. Deeks has said. I have been following that same line of diet for about eighteen years in the Tropics and the results are always favorable.

Dr. John L. Jelks, Memphis, Tenn.—Pellagra came to this country about the time of the Spanish-American War and it extended throughout the Southern belt. It is a tropical and sub-tropical disease. It has never traveled north of the Ohio River to any considerable degree. In 1902 and 1905 financial conditions were horrible. I sold cotton for 5 cents a pound.

I learned from my dear father that he lived during the war on corn and they had no pellagra then. However, diet is an important factor. In 1912 I referred to the fact that I could give my patients one or two slices of toast and in twenty-four hours I could change the bacterial flora and increase the number of infective organisms. A carbohydrate diet has a marked effect on the intestinal bacteria.

I never fail to find flagellates in great numbers in pellagra. I never found them numerous without symptoms, and I always find them in pellagra, although we were taught that flagellates were non-pathogenic. They culture best if the patient is on a diet which causes fermentation. If the patients are put on milk the flagellates are starved. If they are given plenty of milk and the carbohydrates are cut down the bacterial flora will be reduced, in proportion the flagellates are reduced and thus pellagra symptoms. I wish that there were somebody in this country with some money who could be interested in establishing in Memphis a laboratory for the study of this disease.

Dr. T. C. Terrell, Fort Worth Texas.—A few years ago, at a meeting of the Southern Medical Association in Hot Springs, Arkansas, Dr. Jelks and I had a lengthy discussion in regard to pellagra, and through the encouragement of Dr. Jelks and Dr. Wilmer Allison of Fort Worth, Texas, we started work, from a laboratory standpoint, on pellagra. The first work was done on blood cultures, and after a year in this line of work, studying the blood and blood cultures, both from stained and dark field preparations, we decided that we would have to study the condition from a different standpoint. About this time, a youngster, four years of age, came into the laboratory, with a typical case of pellagra. We took blood cultures in a specially prepared media, which is a modification of Hasting's media, consisting largely of Ringer's solution and the white of an egg, with sufficient sodium hydroxide to keep it from coagulating upon sterilization. The culture was grown under anaerobic conditions in this media for approximately three weeks time, then it was transferred to a large flask containing a large amount of the media, and sheep blood was added for the hemoglobin, then a vacuum was pulled and the culture was grown for a period of three weeks time. At this time the culture was evaporated to dryness, and the residue extracted with methyl and ethyl alcohol. Taking half of the residue for each extraction, and using this as an antigen, we carried out the complement fixation test. Using known pellagrins, we got a definite positive reaction. Then, after proving that known negative cases did not give a positive reaction, we started our work, and, at the present time, the clinicians of Fort Worth say that we are checking with their findings in practically 100 per cent of the cases. The greatest difficulty that we have had is that our antigen will give a positive reaction with a

sphilitic patient's serum, therefore, syphilis has to be ruled out in all cases first.

In regard to flagellates and other intestinal parasites, I remember only one case of pellagra in which we were unable to find some form of intestinal parasite. The most common parasite found is the *Blastocystis hominis*. These patients on a high protein diet improve and the symptoms of fermentation, diarrhea, and gas are diminished.

Dr. Seale Harris, Birmingham, Ala.—We are seeing more pellagra-phobia in Alabama than pellagra; and perhaps a considerable proportion of the cases reported as pellagra are of that type.

I want to relate two cases which show the pre-disposing cause of deficient diet to infections. One patient, a diabetic of several years standing, had been on a very restricted diet and developed tuberculosis. He lived in Birmingham, a well sewered city in which I have never known true pellagra to occur. The other was a diabetic from Mississippi who had been on a high carbohydrate diet for many years, and she developed pellagra. She lived in a section in which pellagra prevailed. I think it is perfectly reasonable to assume that in these two cases the undernourished individuals were susceptible to infections, in one case to tuberculosis, due to a known infection, and in the other to pellagra, in which the infective agent is unknown.

The experiments of McCarrison are quite suggestive and I think will be the basis of discovering the organism that produces pellagra. His observations in the Himalayas showed that the natives did not have the intestinal diseases found among civilized people. He thought their immunity to abdominal infections was due to what he called a natural diet, that is fruits, nuts, leafy vegetables, milk and coarse whole grain corn meal. He experimented on thirty-six monkeys some of which he fed on the native diet of fruits, vegetables, milk and cracked whole corn, and the monkeys remained normal. Others he fed on a high carbohydrate diet and they all developed diarrhea and enteritis. He finally fed some of the undernourished monkeys on a mixed diet and they recovered. He fed the *Entameba hystolytica* to some of the monkeys that had been on a high carbohydrate diet and produced in them amebic dysentery. With the monkeys on the natural diet of the natives he was never able to cause amebic dysentery. The soil has to be prepared for infections and, in my judgment, a high carbohydrate diet, particularly of cane sugar products, predisposes to some unknown infection that is the essential etiological factor in pellagra.

In 1906 when I first saw the cases at Mt. Vernon, Alabama, and later in my private practice, diet lists were worked out on the theory that pellagrins are undernourished, but that pellagra is probably an infectious disease.

After the war in Germany, Italy, Austria, Belgium and France, where the people were living on a high carbohydrate diet (they had in the Northen part of Italy practically no meats). I did my best to find cases of pellagra. Physicians in Germany told me the Germans had all sorts of eruptions during the World War because they could not get soap; but they had seen no pellagra. I could find none in France nor Belgium. In Rome Bastianelli said that he had not seen a case of pellagra, but that there probably were some around Padua. In the American Hospital in Padua they had four or five thousand Italian soldiers who were living on a high carbohydrate diet but there was no pellagra. In Triests and Fiume I could find no pellagra, but was told that there was some further north and some in Southern Russia.

Dr. John L. Jelks, Memphis, Tenn.—I wish to ask Dr. Deeks a question. I have been as I believe reliably informed that during 1909 the first case of pellagra appeared in the Panama Canal district, and the cases rapidly increased. By 1913 it had reached the proportion of an epidemic and the disease in that country attacked the women and children more than it did the men. Now let us view the economic status of these laborers. Most of the laborers were recruits from the great Bahama Islands in the Caribbean Sea. In their home country their average day wage was approximately 30 cents a day, and the food they ate in their home country was principally rice, with some beans, bananas, plantains, yams, starchy food, dried, fresh fish and such other dainties as 30 cents a day would buy. The minimum wage for Canal Zone service for common labor was 75 cents a day and ranged up to $2.00; in addition most of the quarters were furnished free and government commissaries opened to them at cost prices and 20 per cent. The sanitary department urged the laborers to partake of a well balanced diet, and tried by diet kitchens to show the value of proper food, which was to make for strong and efficient labor. Here we have a people whose economic status was increased over 100 per cent, and who were given and urged to partake of an easily acquired and much better balanced diet than they had ever known. Yet soon after pellagra broke out and became an epidemic among those people. I should like to know from Dr. Deeks whether that is correct.

Dr. W. E. Deeks, New York, N. Y.—The first cases of pellagra that I saw were following a paper by Dr. Haynes of South Carolina on the Canal Zone in 1906. Most of the Canal labor was from the West Indies. There was no epidemic of the disease on the Isthmus, but I have seen epidemics of it in Jamaica where the diet was chiefly rice and once a week dried fish.

In the Canal Zone our most dependable laborers were West Indian negroes. As a rule the colored man knows how to feed himself when it is possible for him to obtain the proper food. We have many of them now on the plantations of the United Fruit Company in Central America and there is less disease among them than in the natives of the respective countries to which they have emigrated. Most of them have some education, they are cleanly in their habits of living, their first consideration is their stomach and as a rule they are well nourished. The malaria rate among them is one-half what it is among the other races. The diet of the people in the Canal Zone was corrected very early, and they were taught how to live. One thing that we have never properly appreciated is the ill-effects of too much white bread in our diets. If you will preserve the alkalinity of the blood you must eat a generous quantity of root and green vegetables and fresh fruits. In the South there is consumed an excessive amount of sweet and starchy foods.

Dr. G. C. Mizell, Atlanta, Ga.—It is permissible to make a diagnosis of pellagra in the absence of a dermatitis for the purpose of the treatment. I feel that pellagra often occurs without dermatitis, but the mouth symptoms are not peculiar to pellagra by any means.

I have seen a mild Vincent's infection in the mouth that could not be differentiated from pellagra. For scientific exactness I do not think we should make a diagnosis of pellagra in any patient who does not present the characteristic dermatitis.

Dr. Dearman (closing).—I cannot entirely understand why a patient with pellagra, who has a diarrhea, and is on a low protein diet, shows a marked indicanuria. Indicanuria is an expression of an intestinal putrefaction, high up.

It may be that the black tongue in dogs is analogous to pellagra, in the human being, however, this has never been proven. Sprue resembles pellagra, but there are definite symptoms that will clearly distinguish the two diseases.

It is quite interesting to have a neurasthenic or psychopathic individual with a gastric neurosis, who has been on practically a starvation diet for many months. I recall a patient who had lost 80 pounds in weight, who was afraid to eat, and his diet for a period of over twelve months had consisted of soda crackers and oatmeal. His skin was harsh and dry, and there was depicted on his face every evidence of starvation. However, he never developed stomatitis, diarrhea, nor any skin symptoms suggestive of pellagra.

There are a few conditions that may closely resemble pellagra, especially certain chronic toxic states, however, in these the triad of pellagra symptoms is lacking. There are many conditions of stomatitis, gastric distress, and diarrhea that cannot be satisfactorily explained.

CONSERVATIVE UROLOGY IN CERTAIN RENAL LESIONS*

By J. Hoy Sanford, M.D.,
St. Louis, Mo.

With refined methods of diagnosis and with surgical preparedness and efficiency, the tendency today is toward conservatism in urology.

SUPPURATIVE KIDNEY

In the suppurative, non-tuberculous kidney a striking advance has been made toward renal conservation. Seldom is nephrectomy advised in the acute hematogenous kidney with solitary or multiple abscess of the cortex, since most of these patients get well if treated conservatively. Occasionally a decapsulation or nephrostomy may be indicated.

The ureteral catheter has been the outstanding factor in the great reduction of kidney surgery, as well as in mortality. The very acutely infected kidney, especially the retentive type, should be catheterized immediately. Temporizing with such a kidney is subjecting it to infection with possible extension into the parenchyma, not to mention the profound toxemia associated. An acutely infected kidney with associated edema needs drainage, as it is mechanically blocked. Occasionally this type of kidney will clear up without ureteral catheterization, but it may do so at the expense of the kidney, subjecting the kidney to possible extension of the infection and chronicity. Again, the illness may be prolonged over an indefinite period with toxicity and with the possibility of recurrence.

The indwelling ureteral catheter in some severe acute kidneys with retention is a conservative step forward to avoid a badly crippled and possibly a chronically infected kidney. The indwelling ureteral catheter is just as efficient in its end results as is the indwelling catheter in bladder drainage, where obstruction is behind the process, both in preservation of renal tissue and in preparation for operative interference.

In pyonephrotic kidneys where nephrectomy is indicated, as proven by complete urological study, the ureteral catheter, preferably indwelling, is sometimes the means of avoiding a two-step operation (primary nephrostomy and secondary nephrectomy), provided drainage is found adequate through the catheter, with the result that a secondary nephrectomy, which is at times difficult, is avoided.

As a result of the efficient catheter drainage toxicity is greatly diminished and the general improvement of the patient transforms the operative picture from a hazardous outlook to one of much less serious nature.

A two-stage nephrectomy, where ureteral catheter drainage is impossible or inadequate, in massive infections, as judged by profound toxemia, is a conservative step forward in the reduction of kidney mortality. This operation should not be unintentional, but definitely intentional. It may work a hardship on the operator, as a primary nephrostomy at times makes the nephrectomy much more difficult, but this is more than compensated for by the very appreciable diminution in the size of the kidney, diminished bleeding and the tremendous reduction of the patient's toxicity. Nephrectomy in this type of operation is facilitated by making the interval between the two-stage operation as short

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*Read in Section on Urology, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

as possible, the patient's general condition being the deciding factor.

Blood transfusion deserves mention in profoundly toxic conditions, as it is a very valuable aid in the pre-operative preparation and post-operative care of the patient. It should be utilized much more routinely as experience and observation have definitely shown that in infections, hemorrhage, anemia and shock blood transfusions are of inestimable value.

Conservative surgical technic, using a small incision for nephrostomy, freeing the kidney posteriorly, doing as little manipulation as possible, reflecting the peritoneum, including the sinus if possible in the second operation, selecting sub-capsular or intra-capsular nephrectomy, transfixing the pedicle and ligating individual vessels are important steps in a successful secondary nephrectomy.

We should be very slow to remove a suppurative kidney that has fair function without a thorough test of conservative measures: irrigation by ureteral catheter for those of lesser degree, and drainage through the loin in more advanced cases.

I should like to report a case which brings out the remarkable degree of come-back that a badly disabled kidney will at times show.

A young man was seen who had a large left-sided renal mass, with associated toxic symptoms. X-ray for stone was negative. The kidney was practically devoid of function over a period of fifteen minutes, demonstrated by separate kidney catheterization. There was marked retention of staphylococcus pus, with extension into the substance of the kidney in the form of a cortical abscess, and rupture of the abscess into the peri-nephritic space with marked suppuration (peri-nephritic abscess) and spontaneous rupture through the diaphragm into the lung. Immediate and extensive drainage of the peri-nephritic space brought good results.

At the time I operated I palpated this kidney, which was moderate in size, soft and boggy in consistency, with a small rent at the lower pole, which was conclusive evidence of the rupture of the cortical abscess into the peri-nephritic space. The diaphragmatic sinus healed, pus finally ceased draining from the side, and the kidney, which had been badly crippled, was restored to normal, as was demonstrated by complete urological examination. He had clear urine, no infection, no retention, a normal pyelogram, and normal kidney function. This patient had been advised to have an immediate nephrectomy two weeks before I saw him.

We should no longer allow the knowledge that one good kidney is sufficient to carry on urinary excretion to influence us to radical measures until conservative treatment has definitely demonstrated the folly of temporizing.

In some renal suppurative conditions where nephrectomy seems indicated but the other kidney gives evidence of a suppurative process, we should be very careful about hasty surgery. The other kidney may later suppurate as did the one removed.

KIDNEY CALCULUS

In kidney calculus a conservative rather than a radical attitude is advisable. Not every stone in the kidney demands surgical removal. A stone causing no symptoms and located where blocking of the ureter seems unlikely, and in which there is no accompanying infection, requires no surgical interference. I shall not discuss this type of calculus, but shall confine my remarks to surgical calculus. These cases are classified by the size and location of the stone, interference with flow of urine from the kidney, pain, infection, retention, destructive changes in the pelvis and disturbance of kidney function.

Stones may be single or multiple, large or small, unilateral or bilateral. The problems to be solved by conservative treatment or surgical attack will be classified in three groups: (1) nephrectomy; (2) conservative operation; and (3) conservative palliative treatment by ureter catheter drainage.

Nephrectomy is indicated: (a) when the kidney has no further functional value; (b) complicated by secondary malignancy; (c) in the presence of massive infection and deformity; and (d) in previously operated kidneys with or without fistulae.

Before selecting this type of kidney for nephrectomy we should be thoroughly convinced that the kidney function cannot be restored to such a degree that a more conservative type of operation is indicated. The recuperative power that a kidney will occasionally show after the removal of stone or stones is surprising. This, of course, cannot be expected unless all portions of its interior drain readily into the ureter.

Conservative operation is indicated:

(a) If removal of stone, or stones, can be accomplished without much damage to the kidney.

(b) In the presence of bilateral calculus, marked infection, or when some other pathological lesion is demonstrable in the other kidney.

(c) With a history of repeated stone formation in both kidneys.

Conservative palliative treatment by ureter catheter drainage is indicated:

(a) In the presence of extensive bilateral calculus or other disease in the opposite kidney, and in the absence of acute symptoms or complications.

(b) In the case of bilateral calculus previously operated upon and with recurrence, ureteral catheter drain-

age and lavage seem the most conservative procedure to undertake.

This type of case must be checked by separate kidney tests as regards function and infection and by x-ray to note the increase in size of the stone, or stones, at regular intervals. If the infection or pain is not controlled by ureteral catheter drainage, operation will have to be considered.

Pyelotomy is the ideal operation, as it is comparatively easy and gives good functional results. It does not disturb the integrity of the kidney, and hemorrhage and fistulae are rare. A small intra-renal pelvis inadequate for manipulations with a stone of such size and location that incision of the pelvis will not permit its removal are two conditions that make pyelotomy at times impossible. In stones situated in the kidney where pyelotomy seems inadvisable, nephrotomy or a combined pyelo-nephrotomy is indicated. In cases where the stone is easily accessible due to a thinning of the cortex, nephrotomy is a very popular operation. Pyelonephrotomy seems to be especially adapted to stones that are not accessible to incision of the pelvis or to cortex incision, requiring the combination. The type of operation that will facilitate removal of stone or stones by counter pressure, permit thorough exploration of the pelvis, establish good drainage and allow irrigation for removal of sandy concretions or deposits is the operation that will be less likely followed by recurrences and will probably restore the kidney to a nearly normal condition. Pyelonephrotomy does this and is indicated in many cases that are subjected to nephrotomy. Drainage of the kidney with a rubber tube after nephrotomy or pyelonephrotomy is a safe and valuable assurance against hemorrhage and infection, and puts a badly crippled kidney at rest. Recurrence of stone is an important study and is influenced by inadequate drainage, scar tissue, infection, failure to remove all of the stone or stones, and the leaving behind of sandy concretions. Fluoroscopic examination or x-ray of the kidney immediately after removal of the calculus is of value to show missed stones. In the case of bilateral stones calling for surgical treatment it is as a rule wiser to operate upon the side showing the lesser function first, for by so doing you have the better kidney for dependency during the first few post-operative days.

A step forward is the careful pre-operative preparation of these patients by ureteral catheter drainage and lavage. Infection is thus diminished, function improved, the operative field is better prepared, and post-operative health is facilitated.

Post-operative care is equally important, for by ureteral catheter drainage infection, which is a factor in some recurrent stones, is controlled; strictures are avoided, particularly in pelvic stones; function is improved, and bladder symptoms are cured. Careful recheck by x-ray and urinalysis should be made at intervals after calculus operations over a period of at least two years.

URETERAL CALCULUS

Ureteral calculus is in reality kidney calculus that has passed down the ureter. Tremendous strides have been made in the treatment of ureteral stones by conservative methods. It has been estimated that about 90 to 95 per cent of ureteral stones pass spontaneously or after intra-ureteral manipulations. The comparative size of stone and ureter, the shape of the stone and its location in the ureter, associated infection, degree of kidney functional loss and deformity, severity, duration, and frequency of colics, systemic reactions, condition of the other kidney, associated disease of the affected side other than stone, and reaction to instrumentation, are some of the factors to be studied to determine the relative merits in the case of intra-ureteral dilatation and surgery. A division of non-operative and operative cases can be made only after careful study.

If the stone is sufficiently small to permit good drainage and shows radiographic evidence of downward movement, and the kidney is free of infection with good function, one is justified in continued intra-ureteral manipulations to invite passage of the stone. These intra-ureteral manipulative methods may extend over an indefinite period.

With the advent of infection and retention the picture is immediately changed and calls for conservative thought and study to determine the advisability of continuation of intra-ureteral manipulations or interference by surgery. One's conclusions should depend upon the following conditions: if under catheter drainage the infection and retention are easily controlled, no signs of intra-renal pressure are apparent, the patient's general condition is satisfactory and his tolerance to instrumentation good, we are justified in trying to tide the case over at least for a certain period of time before doing surgery. If, on

the other hand, infection and retention are not easily controlled and the patient persistently shows toxemia and his tolerance to instrumentation is disturbing, surgery should be performed.

In the face of functional disturbance and kidney deformity where infection and retention with associated toxemia are present at the time the patient is first seen, intra-ureteral manipulations should be given little consideration and surgery is the method of choice.

The silent ureteral stone which is destructive to the kidney deserves much consideration and we should always be on the look-out for it.

I have seen a patient with a stone about the size of a hazel nut in the pelvis of the kidney. The patient's only complaint was a dull pain in the kidney region. There was no infection, the kidney function was undisturbed, but the stone silently slipped down the ureter and killed the kidney. This silent passage of the stone with destruction of the kidney occurred over a period of six months, during which time the patient was so free of symptoms that he did not report back for treatment.

It is important in treating ureteral stones by intra-ureteral manipulations to keep a careful check on the patient's kidney function from time to time and to satisfy yourself that there is no great interference with the passage of urine from the kidney to the bladder.

One must always consider the possibility of the variation in size of the ureters in individuals. Ureters, like faces, are different. The size of the stone may not decide the question of whether to operate, since surprisingly large stones will pass from ureters that are either of large size normally, or that have been dilated by long-standing stone formation. In this type of case, where there is a history of previous colics with the passage of stones, one is justified in temporizing if there is no infection or retention. If the infection and retention are controlled by the ureteral catheter, further intra-ureteral manipulations are advisable and safe. Otherwise, surgery is indicated.

In children the ureters are apparently more flexible and children accept ureteral catheters that are surprisingly large with much less reaction than do adults. Ureteral stones in children of such a size that passage seems possible should be faithfully treated by conservative methods unless these are contra-indicated by systemic disturbances which give evidence of obstruction to urinary flow.

Migrating stones in the presence of unquestionable renal disturbance should be dealt with surgically.

Impacted calculi where ureteral manipulation fails to establish prompt drainage, especially in the presence of renal disturbance, call for surgical interference. This is particularly true if the opposite kidney is incapacitated by a pre-existing pathological condition.

In bilateral ureteral stones, intra-ureteral dilatations must be done with caution, as sudden and acute infection with coincident blockage may invite the serious problem of acute suppression of urine.

In the case of anuria due to sudden and complete blockage of urine in one kidney, if one ureteral catheterization fails to establish drainage, immediate operation is advisable.

The fascination of watching the descent of a ureteral stone, with its bag of tricks, should not distract one's attention from the kidney above which should be guarded against infection, retention and intra-renal pressure.

Post-operative care is important in this type of case and should bring about total disappearance of infection. The ureter should be dilated a few times following passage of the stone. This dilatation is more useful in cases of stones of long standing, especially the impacted and faceted types, as fibrosis or scarring of the ureter at the former site of a stone is productive of structure formation and infection, which may bring about recurrence of stone.

HYDRONEPHROSIS

Our knowledge of the increasing frequency of bilateral hydronephrosis has made us somewhat hesitant about a quick decision to remove the kidney for this condition. I have reference to the hydronephrosis due to anatomical abnormality, whether stricture, valve or abnormal distribution of renal vascular supply. It is in this type of renal stasis that the obstruction is a mechanical one, frequently uninfected, and at times offering much promise to conservative operative procedure. This type of hydronephrosis is frequently confined to the pelvis with the result that a considerable amount of renal parenchyma is undisturbed and capable of moderately good function.

Some excellent results have been reported by competent urologists on ligation and section of aberrant vessels with various plastic operations on the pelvis. These plastic operations offer much promise, but will have to be supported by

further clinical data before they are generally accepted as useful. They are at least worthy of trial and if they are unsuccessful as demonstrated by follow-up function and comparative pyelographic study, more radical surgery can be done. It is at least a conservative step forward in the conservation of renal tissue and no doubt will develop with improvement in surgical technic. This will be a great achievement in conservative surgery, especially important in cases of bilateral disease.

In congenital strictures, at the uretero-pelvic juncture, dilatation with graduated dilators or bougies is a valuable aid to treatment, and is at times productive of excellent results.

As all these conservative measures become better understood and are recognized as useful in the conservation of renal tissue, the idea of quick and easy removal of a hydronephrotic kidney with fair function, for the prompt relief of pain, can be expelled by our knowledge of the increasing frequency of bilateral hydronephrosis. We should attempt at least the more conservative measures, dilatation, release of aberrant vessels or plastic surgery on the pelvis, before such destructive surgery as nephrectomy. Nephrectomy should be reserved for the cases which are totally devoid of function and secretory power.

UNDIAGNOSED RENAL HEMATURIA

We have advanced in our conservative attitude in this type of renal hematuria in that we do not nephrectomize these patients at present as ruthlessly as we did in the past. This is due to several reasons:

(1) Refinement in diagnostic technic.

(2) Feeling of unsafety from previous experience or reports of our co-workers as to the absence of pathological findings after careful examination of removed specimens, or to the chagrin of finding a nephritis, localized or general, that is no doubt present in the remaining kidney.

(3) The disappearance of this condition with pelvic lavage, decapsulation or nephrostomy for reasons not exactly understood.

Various theories have been advanced for this type of renal hematuria: it has been considered due to a localized nephritis, renal papillitis, pyelonephritis, pyelitis granulosa, blood dyscrasia, and varicosities. Early tumor and tuberculosis are the conditions that give us most concern in these undiagnosed bleeding kidneys. Normal pyelograms are the best evidence of the absence of these. It is necessary to repeat the pyelograms over a considerable period for comparative purposes. At a later date tumor or tuberculosis may become apparent and be missed by not rechecking. If it is possible to make pyelograms of these patients when they are not bleeding it should be done, as during active hemorrhage a blood clot may give a filling defect and closely simulate tumor or tuberculosis.

These cases are not surgical, as they can be controlled in many instances by pelvic lavage with silver salts in increasing doses, or even by one ureteral catheterization. Occasionally decapsulation or nephrostomy will cause total disappearance of the bleeding. Some may be benefited by intramuscular injections of blood serum. If the bleeding is severe and not controlled by transfusion and the patient's blood picture becomes alarming, nephrectomy as a last resort is justifiable.

Recognition of minute kidney lesions by our improved diagnostic methods, especially pyelographic interpretation, is possible, but occasionally gives us a distorted perspective and causes us to lay great stress on relatively slight variations from the normal. With such a picture we are prone to attempt a surgical triumph that is sometimes not as conservative as it might be.

Palliative measures with careful and complete urological study and comparative pyelograms at intervals with utilization of all the other diagnostic aids at our command should be tried over an extended period of time in the face of little or no improvement in this type of case before radical measures are adopted, unless bleeding becomes severe enough to jeopardize the patient's life.

University Club Building

DISCUSSION *(Abstract)*

Dr. W. J. Wallace, Oklahoma City, Okla.—Usually in the management of my cases of acute suppurative kidney I depend principally upon rest, the free intake of spring water, urinary antiseptics and intravenous medication. Very rarely do I have to resort to ureteral catheterization. However, there are certain cases in which this is necessary, especially when we find stricture, angulation and mobility, and in certain cases of pyelonephritis of pregnancy which from pressure or position is causing retention.

In the pyelonephrotic kidney the indwelling catheter has never been of any great use to me, except in making a differential diagnosis, thus determining the function of the opposite side. This type of kidney is truly a surgical one. If the other kidney is healthy a nephrectomy is indicated. I prefer doing this in one stage, but occasionally we find a complicating perinephritic

abscess, and in this condition I think it is safer to do a two-stage operation.

I am glad that Dr. Sanford placed stress on blood transfusion in certain renal diseases, for it is very necessary in suppurative and anemic cases. Its use prior to operation is unquestionably a life-saving factor and it should be more generally employed.

In nephrolithiasis every type of renal calculus is a potential if not an active trouble maker, and if the calculi are located in the pelvis, whether they are movable or stationary at the time of examination, I think they should be removed. The sooner this is done the better for the patient, for if they remain pain and infection will surely develop, making the operation much more hazardous for the patient. So why wait? This may seem radical, but from experience I have learned that the earlier the operation the more favorable the prognosis.

Dr. Tom Barry, Knoxville, Tenn.—We all appreciate the value of the ureteral catheter in renal infections, but I believe that much harm can be done if it is employed indiscriminately. Seldom is there any indication to insert a catheter into an acutely infected kidney during the first few days, since at this time there is usually marked edema and swelling of the ureter and pelvis, which can only be accentuated by instrumentation. If there is urgent indication for relieving stasis, I prefer to use a No. 9 or No. 10 catheter, aspirating the fluid, lavaging with sterile water, and removing the catheter. In my opinion frequent insertion of a large catheter is superior to the use of small, indwelling catheters. I congratulate any one who can maintain drainage through a No. 5 or No. 6 catheter for any length of time, for in my hands they usually become blocked in the first few hours. I believe few of us would advise instrumentation of an acutely inflamed urethra or bladder, unles there were acute retention, and I think the ureter and urethra are somewhat alike in this.

A two-stage nephrectomy is often a life-saving procedure, and we should resort to it more often.

Dr. W. H. Toulson, Baltimore, Md.—There are two things to think about in conservative urology. First, in renal surgery, conservatism does not mean a conservative exposure. Often we can get at the pelvis better by wide exposure.

Recently a patient was admitted to our hospital with vague abdominal symptoms with a few pus cells in the urine. The urinary tract was examined repeatedly with negative results. Later it was found that he had a beginning lymphatic leukemia with a spilling-over of leucocytes into the urine at times.

Dr. Gordon Craig, Sydney, Australia.—I operate upon large infected hydronephroses or pyonephroses in very feeble patients under local anesthesia. A small incision is made in the loin down to the muscle, then a trochar and cannula of about 28 Charriere, grasped firmly in the right hand, is plunged straight through the muscle into the hydronephrosis and the fluid is evacuated. The left hand is used for counter-pressure. With the cannula still in position a rubber tube about the size of 24 Charriere, is passed through the lumen into the cavity of the hydronephrosis. The cannula is then drawn out, leaving the rubber tube in position. This operation can be done in patients who are feeble and unable to stand a general anesthetic. It is a simple procedure which, like a first stage of prostatectomy, may tide the patient over until a radical operation can be performed.

UTILIZATION OF THE SUMMER VACATION OF THE MEDICAL STUDENT*

By RUSSELL H. OPPENHEIMER, M.D.,
Atlanta, Ga.

The advice to be given the sophomore and the junior student in deciding the use of the long vacation can best be determined by an analysis of what purposes these vacations can serve. Such purposes seem related to the student's financial condition, his state of health, and his desire to promote his medical education.

During the past decade the cost to the student of a medical education has doubled. Some are enabled to continue their study only through the money they can earn during vacation. Others feel that they will be too greatly in debt should they not devote their vacation to remunerative work. We may feel tempted to urge the financial poor student to incur even greater indebtedness in order that he may devote his vacation to study. To magnify his indebtedness, however, may mean to magnify or develop a commercial attitude toward his profession, a risk we are hardly justified in assuming.

That student who is so unfortunate as to be burdened by physical disability must necessarily devote his vacation to minimizing this handicap.

For the student whose health and financial condition permit, the long vacation offers an ideal opportunity for study. Freed from the class room, the roll book, assignments, required work, quizzes, and student responsibility, he is at liberty to seek, inquire, read, and study; that is, to forage for himself in the fields of medicine. He will feel that what he gets will depend entirely upon himself. The exact nature of the study will be determined by his previous experience and, to some extent, by his plans for the future.

The sophomore student has not yet acquired the elementary principles of clinical medicine. He has no well formed clinical ideas. He has not learned the fundamentals of medical procedure and thought. Therefore, he should not look to the field of clinical medicine. He would be unable to appreciate the things he met there

*Read in Section on Medical Education, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

and, what is more serious, he would be susceptible to the formation of ideas and concepts which are incorrect. He would surely develop the most fatal of all errors of medical habit, that of working backward from a pre-formed diagnosis to the indications which went to make it. There may be exceptions to this rather dogmatic viewpoint, but only when an unusual student is blessed with the most painstaking guidance.

Accordingly, for the sophomore student there is the opportunity for a deeper and more comprehensive study of one of the preclinical subjects with which he is already familiar. The study of medicine is essentially a study of the structure and function of the human body as a whole and of its individual tissues. So, what greater benefit can he attain than to acquire a more intimate knowledge of its structure in the dissecting room or of its function in the physiology laboratory? Should he feel that he is sufficiently well grounded in normal structure and function, let him enter the laboratory of pathology where he may gain a fuller insight into the deviations of tissue structure as wrought by disease. Here he may be safely shown some of the clinical pictures accompanying the pathological conditions which he sees.

The benefits to be derived from a vacation spent in this manner are far greater than at first sight appear. The student will have learned to do one thing well and to plunge below the superficial. He will have developed a thoroughness of study and procedure. He will have developed an easy acquaintance with medical literature. He will have made of physiology, anatomy, or pathology what we may call a forte: an assurance that in his clinical years he will always think of his patient in terms of structure and function as well as in terms of presenting signs and symptoms.

With the junior student the situation is different. He has acquired a store of clinical ideas, concepts, and principles. He has been taught the proper procedure for clinical study. He is capable of attacking the problem which the patient presents. At the close of the junior year the student is invariably eager to go ahead. He is anxious to try his skill. He is at the height of his mental activity and receptivity. It is contrary both to ordinary reason and to pedagogic principle to permit him to stagnate through a long vacation during which he is dissociated from his life purpose.

For him, a hospital clinical clerkship, a student internship if you prefer to call it, offers the greatest opportunity. This should be either in a teaching hospital or in one where suitable supervision will be assured. Inquiry, during the past six years, among students who did such work in their junior vacation establishes the fact that every one proclaims it the most valuable period of his entire medical school career. Observation of these students during their senior year shows them to have keener insight than their classmates who have not had this experience.

Outside of the hospital there is the opportunity of an association with a practicing physician. He should be chosen on the basis of the quality of his professional life and his ability as a preceptor. This, the preceptor system, has already been tried and found effective. It has one peculiar advantage: under it, in addition to continuing his contact with and study of patients, the student learns something of the problems and of the art of the practice of medicine.

DISCUSSION (*Abstract*)

Dr. Stuart Graves, Louisville, Ky.—There are two ways in which a vacation may be spent: in practice and in reading. I shall speak first of the men utilizing their summer after the sophomore year. I cannot conceive of any boy who has succeeded in his sophomore work with reasonably good credits having the heart to go into a laboratory in any Southern territory for two and a half months more for the study of general pre-clinical science. There may be an occasional man who will do it and derive much benefit from it, but I think it would be better if he were diverted to some other field of medicine that would stimulate his imagination.

After the junior year, however, the student becomes very much more interested. There are two ways in which a junior can pass a summer vacation very profitably. One is to secure some sort of position either as a resident or extern in connection with a good teaching hospital. We have found at home that a considerable number of juniors will elect to become externs in the dispensary, and for such men a regular course of work is outlined, sometimes to meet their particular desires. The student may be assigned to the medical or surgical dispensary or to obstetrical work. That helps the hospital a great deal because we have to keep up the home delivery service during the summer as well as during the school year, and the boys gain valuable experience for themselves.

There is another field to which a great deal of attention is being paid. We have under consideration now a plan whereby fifteen practitioners can be selected in the State, in towns not over 5000 people. We hope to be able to select these men not only for their professional attainments but also for their character, personality and ideals. Then we hope to call for a certain number of volunteers from the junior

class, possibly as many as fifteen, and assign those boys to men who are in general practice in the country having them spend about ten weeks of the summer vacation in that way. It is hoped that many of them will go many miles from a railroad and we fancy it will do a great deal to bring the undergraduates in close contact with the higher grade of practitioners in small communities. It will certainly be stimulating to the older men and I believe it will be very helpful to the embryo physicians. It may be one way to attract a higher grade of students to practice in the country. That method has been tried to a very limited extent and I believe has been proven to be very desirable.

There is another thing that medical students can do during the summer that they may not have opportunity for during the rest of the year, and that is to read. This applies particularly to boys who are earning their way through the medical school and to some students who find it necessary to recuperate their physical health during the summer. It seems to me an important thing to stimulate good reading. Dr. Roberts published a very good list of books four or five years ago. I read recently a very interesting book written by Claude Bernard. He reduces most medical studies to those of function and structure. Around structure you can group all those courses that have to do with morphology. Around function you can group physics, chemistry, physiology and all other sciences having to do with the vital activities of the cell. Bernard notes a third field composed of therapeutics and treatment of disease, and we can add to that now preventive medicine, because that is really treatment of disease also in the most forward looking sense.

If a student could have his attention drawn to such books or to an inspiring biography like Cushing's "Life of Osler," it would not matter whether he was earning money or working in a hospital, he would get something that he would retain longer than he would the morphology of the bones.

Dr. Wilburt C. Davison, Durham, N. C.—I think the best way to solve this question of long vacations is to eliminate them and to make the academic year forty-four weeks instead of thirty-three. In that way the students can obtain their degrees of Doctor of Medicine in three calendar years. After all, most medical students work during their summer vacations; about 50 per cent of them work on pre-clinical or clinical subjects in some place or other, and if this time were spent under supervision at a medical school much valuable time could be saved. The 50 per cent who earn money during the summer vacations could probably earn more in the year after graduation which they will save under the four-quarter system than in the three vacations of four months each. This plan is satisfactory to the medical boards of 31 states and I hope that those of the other 17 will accept an interne year in lieu of the fourth calendar year of medical school. I believe that a better physician can be trained in three years of 44 weeks each than in four years of 33 weeks and that as he will be one year younger at graduation he will be more likely to spend more time in hospitals than is usual at present.

Dr. Isaac J. Jones, Little Rock, Ark.—We have made no organized effort toward advising our students in their sophomore and junior vacations, but as I am director of the clinical medical laboratory of our outdoor clinic I have had applications from country physicians for students to do ordinary laboratory work during the summer months and have been able to place several in that manner. It has proven very valuable both to the student and to the physician.

Symposium on Malaria

CONSTRUCTIVE PROGRAM FOR MALARIA CONTROL*

By WM. E. DEEKS, M.D.,†
New York, N. Y.

In order to complete their life cycle, malaria parasites require two hosts, certain species of anopheles mosquitoes, and man. Sexual conjugation takes place in the stomach of the mosquito, followed by the development of oocysts and sporozoites. Asexual reproduction takes places in man with the development of gametocytes, male and female. Malaria parasites produce pathological lesions or disease in both hosts, which may prove fatal to either one.

In man the febrile reaction and the symptomatology are due mainly to (1) the toxins liberated during the sporulation of the parasites, and (2) the blocking of capillaries by the parasite infected corpuscles.

The gametocytes apparently produce no lesions nor symptoms and are innocuous unless withdrawn by the mosquitoes, in the stomachs of which their biological functions are consummated. Otherwise, in the human host they eventually die and are phagocyted like any other dead body cells.

In order to make any progress in malaria control, the problem must, therefore, be attacked from two angles: (1) mosquito destruction, and (2) the elimination of parasites from the human subject; and the most important of these from the epidemiological standpoint are the gametocytes.

Before discussing constructive measures for malaria control in either of these directions, the introduction of some recently developed data is in order.

In both hosts the individual's resistance or tolerance to malaria infection varies greatly. In mosquitoes, this depends in part at least upon environmental influences and nutritional conditions. In man, in addition, race and heredity are important factors.

It is questionable if we should use the term immunity in connection with malaria infection. By the term active immunity we recognize a more or less permanent condition that develops in the body as a result of the invasion of a pathogenic organism, or some modification of it, or its toxin, which prevents a re-invasion or re-infection by the same organism. This condition, however, may be present as a result of individual heredity, or it may be even racial in character. In the case of malaria, we know that many individuals have a high tolerance to the infection, and others after repeated attacks or relapses, develop gradually a high tolerance to it so as to become relatively immune. Generally speaking, however, one attack of malaria does not confer immunity from a second attack in the sense that we use the word when we speak of immunity to measles, scarlet fever, or yellow fever.

Individual men and individual mosquitoes can be classified either as poor, moderate, or good transmitters of malaria infection. Some individual men have such a high tolerance to the disease that it is almost impossible to infect them, either by the intravenous injection of infected blood or by infected mosquitoes, even though repeated attempts be made. Others again become infected, but develop such a small number of gametocytes that they are practically non-infectious to mosquitoes, or infectious only to a slight degree. On the other hand, a large percentage of men are readily subject to infection, and develop large numbers of gametocytes in their blood, and consequently can readily infect the susceptible mosquitoes that feed upon them.

The same conditions precisely have been found to exist in individual mosquitoes. Some, particularly those living under good nutritional conditions and in a good environment, apparently resist infection; others become infected and may develop oocysts, some of which abort and do not produce sporozoites, while a third group are readily infected, produce large numbers of oocysts, and large numbers of sporozoites over prolonged periods. One of Colonel James' mosquitoes continued infective for 92 days, when it died, and during this period discharged sporozoites into human subjects on more than forty occasions. This observation demonstrates the importance of the destruction of mos-

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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quitoes in habitations, as was recommended many years ago by J. A. LePrince in Panama.[10]

The number of gametocytes found in the peripheral blood in human malarial carriers, varies in different individuals, and in the same individuals at different times. The thick-film blood examinations of the inhabitants of an infected community in an untreated area, shows, according to the survey of Dr. H. C. Clark,[2] that gametocytes are present in from 8 to 15 per cent of those carrying malarial parasites in their peripheral blood, and S. P. James[1] states that they vary in number from 1 to 700 per cubic millimeter of blood. Darling believed that at least 12 to the cubic millimeter are necessary in order to infect mosquitoes, and there appears to be no question that those individuals carrying large numbers of gametocytes are much more infectious to mosquitoes than those carrying small numbers, and are in consequence chiefly responsible for the spread of malaria.

Colonel James believes that owing to the many hazards incidental to the life of mosquitoes, not more than 5 per cent of potential mosquito infectors ever become active infectors. A dissection of the anopheline mosquitoes caught in the labor barracks of the United Fruit Company during any one day, according to Doctors Barber and Clark,[5] shows that only from 1.5 to 5 per cent carry oocysts.

In the thick-film blood survey of 7,201 individuals in the United Fruit Company plantations, made by Dr. H. C. Clark[5] in 1926, 29.8 per cent were found to be infected, and of this percentage 13.5 per cent carried gametocytes. These were representative groups of the inhabitants taken from the port towns, intermediate settlements, and as far out as the most remote camp in certain valleys. At the same time Dr. Clark examined the blood of 124 malaria infected individuals on their discharge from the hospital after they had received 30 to 45 grains of quinin daily for a variable period, which averaged 7 days. Before they were discharged all the acute symptoms had disappeared, the patients felt well, and were able to work. Of these 43.5 per cent revealed gametocytes as against 13.5 per cent of those examined before treatment was given. In addition to those carrying gametocytes 17 cases showed a few young forms, and 3 cases showed only young forms and no gametocytes. Dr. Clark has an accurate record of only 10 of those carrying ring forms. The 3 cases which contained ring forms only, were treated 2, 3 and 4 days respectively. Seven of those which contained rings and crescents were treated 7 days or less.

Dr. Clark has recently surveyed in a similar manner, and over the same areas, the bloods of 4,974 individuals of whom 27.1 per cent were found to be infected. This survey was confined to the camps that had in his first survey shown the highest rate of hospital admissions due to malaria. Previous to this second survey quinin had been given interruptedly through the preceding months to a large number of those examined, and it is interesting to record that the gametocyte percentage was 31.3 against 13.5 per cent in the first survey, previous to which no quinin had been given.

These findings suggest that the administration of quinin favors the development, or in any case the appearance of gametocytes in the peripheral blood, a conclusion which has been confirmed by Doctors Connor, Macphail, Cordes and Brosius, of the United Fruit Company Staff, on cases that have been kept in the hospital on quinin treatment, 30 to 45 grains daily, for periods ranging up to 12 days, and in one of the cases up to 56 days. Generally speaking, the gametocyte rate in acute cases on admission to the hospital approximates from 8 to 15 per cent. After quinin administration this increases within a week to approximate 40 to 50 per cent.

We know that quinin is a curative agent in acute malaria, in that it assists in ridding the peripheral blood of the asexual forms of the parasites which alone are responsible for the symptomatology. Until Dr. Clark's recent observations, confirmed by others, it was not generally known that the estivo-autumnal gametocytes are not destroyed by the exhibition of quinin, but, on the other hand, quinin favors their appearance in the peripheral blood, and cases so treated carry more gametocytes proportionately than non-treated cases. Darling and others, many years ago, drew attention to these findings, but their importance in the control of malaria has never been sufficiently stressed in view of the fact that Darling, Ross, Wenyon, Barber and others, have shown that crescents developed under such conditions are just as infectious to mosquitoes as those developed when no quinin is given.

Herein lies the value of plasmochin, as it apparently influences directly the destruction of the gametocytes, or in any case drives them from the peripheral blood, and thus renders the human host non-infectious to mosquitoes. If further observations confirm this result, plasmochin

will have proven to be of great epidemiological importance. At present we are unable to state definitely the exact ultimate results of plasmochin treatment on the gametocytes, but it is our impression that in most cases they are eliminated completely as far as clinical observations, over prolonged periods, and thick-film blood examinations can determine, and that in others the results are only temporary and sooner or later parasites reappear in the peripheral blood. It is necessary that further observations be made before a definite conclusion can be reached.

We are inclined to believe that malaria relapses are due to insufficient quinin treatment, or to a lowered resistance on the part of the patient as a result of malnutrition, or other coincident depressing influences, such as infections or organic degenerations that interfere with the patient's ability to overcome the infection. Sporulation continues in the deep viscera in such a mild form that the schizonts can be cared for by the defensive agents of the body, which, however, are unable completely to overcome them. There is a guerilla warfare or struggle for existence on the part of both, but no decisive battle. When the resistance of the defensive agents is lowered, the sporulation activities increase to the extent of giving rise to symptoms, and relapses occur.

That gametocytes do not transmit, or cannot transmit, malaria without passing through the intermediate host is indicated by an experiment of Dr. Ian Mackenzie,[8] who reports the case of a Syrian admitted to the hospital with amebic dysentery.

> His blood was found to be swarming with crescents, and, in spite of prolonged examination of more than 100 films, no ring forms could be discovered. There had been no clinical evidence of malaria for many months. Blood from this subject was injected directly into the basilic veins of five members of his family who lent themselves for the experiment, in quantities of 1, 2, 4, 6 and 8 c. c., respectively. In no case did these injections produce an attack of malaria. Some time later, 0.5 c. c. of blood containing plasmodia from a case of subtertian malaria was injected into this Syrian. Within ten days he was readmitted with a typical paroxysm, his blood was swarming with ring forms. In this condition, 0.5 c. c. of his blood was injected into the members of his family previously inoculated with crescents. Four out of five developed an acute attack within two weeks.

Confirmation of this experiment would go far to settle one of the long-mooted questions concerning malarial relapses.

In plasmochin apparently we have the last link in the chain of measures necessary to the effective control of malaria, and the results obtained rest on the intelligent application of our knowledge. An effective control program embraces, first, mosquito control; and second, the cure of the human carrier. In regard to mosquito control there are some points to consider that are of the greatest practical importance.

In the plantations of the United Fruit Company it has been found that almost 75 per cent of the foci of anopheline mosquito breeding are in the immediate vicinity of our habitations under conditions which are largely man-made in character. They, however, are easily corrected with intelligent supervision and economical expenditures.

Dr. Julio Alessandrini,[9] of Rome, states in effect that agricultural development, meaning proper land drainage, clear running water, abundant algae and sunlight (all of which favor the ideal development of anopheles), creates a type of mosquito which is more resistant to malarial infection.

> "Anophelism without malaria is a biological state of resistance temporary or permanent, acquired by the anopheles, and due to better conditions of life, and, with that, better vital functions. This state protects the anopheles from malarial infection.
>
> "Malaria in its extension and severity is in inverse relation to the organic resistance acquired by the anopheles during its larval state, resistance which is due to the biological influence of the medium in which it has lived."

The practical conclusions to be drawn from these observations can readily be appreciated when we realize that domestic animals are usually kept about our habitations and produce muddy tracks and wallows favorable to the breeding of mosquitoes with poor resistance, and hence more susceptible to malaria infection than those whose larvae are developed under better living conditions.

Mosquito control must be practiced either against the larval or adult stage, and this is more readily done in the former. In undrainable areas we have found that Barber's Paris green method is the most efficacious and economical for larval destruction, although under some special conditions, petroleum in some forms may be more satisfactory. In unscreened quarters adult mosquitoes can be satisfactorily dealt with daily "swatting" as recommended by LePrince, or, better still, by insecticide sprays. Without question the proper screening of houses is the most effective method of protecting people from the bites of mosquitoes, providing the house dwellers take advantage of this method

of protection during the mosquito flight, which must include the hours from sunset to sunrise.

Treatment of Malaria Infected Individuals. Two phases of the parasite must be considered in the treatment, the asexual forms and the gametocytes. The activities of the former are responsible for the symptoms in the infected individuals; the latter for the transmission to mosquitoes. For the asexual forms in almost all cases we have an efficient remedy in the salts of quinin. For the gametocytes, an equally efficient agent is plasmochin, which is also of undoubted influence in clearing the peripheral blood of the asexual forms of the benign types of malaria. It is our belief that these agents (quinin and plasmochin) are not directly toxic to the parasites, but act only in conjunction with the natural defensive agents of the body. The exact nature of these agents, whether cellular, humoral, or both, is unknown. In most cases it may be stated that effective doses of quinin, 30 to 45 grains daily, will free the peripheral blood of asexual parasites and also all acute symptoms within 8 days, but in some cases, when coincident infections or debilitating organic diseases are present, much longer treatment is indicated, and we must be guided as to the necessity of further treatment by the result of repeated blood examinations for the presence of parasites. The physical condition of the patient must also be considered. Practically the same period of treatment (8 days) with plasmochin will free the peripheral blood of gametocytes, but in neither case have we any certainty that during this period of treatment the parasites are destroyed in the deep viscera. The combination treatment is therefore indicated, as recommended by Muhlens[4] and others, and demonstrated in our own experiences.

Plasmochin is marketed in two forms: tablets of 0.02 grams and also in tablets containing 0.01 grams of plasmochin combined with 0.125 grams of quinin sulphate. We recommend that the latter be used as routine treatment, but in acute cases this amount of quinin is insufficient, and the tablets must be supplemented by quinin. Unfortunately plasmochin is toxic to many individuals and the symptoms of cyanosis, nausea, gastric distress, methemoglobinemia, and methemoglobinuria, may develop, and unless the drug is immediately suspended until these symptoms disappear, a lethal termination may result. These toxic symptoms, however, are counteracted by quinin, hence the importance of the combined treatment. Our experience justifies us in concluding that with adults the daily dose of plasmochin should not exceed 0.06 grams. We have never seen toxic symptoms develop with this dosage over a period of 5 consecutive days administration, and in many cases the drug has been given in 0.08 gram doses daily in conjunction with quinin over periods up to 12 days without untoward results. Patients taking plasmochin should be under daily observation, and if toxic symptoms develop the plasmochin should be suspended, but small doses of quinin continued. This property of plasmochin necessarily circumscribes its field of usefulness, as it cannot be given out indiscriminately in large quanties for household use.

In the several hundred cases treated in our hospitals, under daily thick-film blood observations, by this combined method of treatment, the parasites (schizonts and gametocytes) disappeared within 8 days of continuous treatment, and in most cases in from 4 to 6 days. There were a few relapses or reappearances of the parasites in the peripheral blood in cases suffering from abscess formations; chronic leg ulcers necessitating skin grafting; and some major operative cases. These were, however, eventually discharged, parasite free, with a further course of treatment.

Dr. O. T. Brosius,[6] of the Almirante Hospital, Panama, gave the combined treatment to ambulatory cases in his hospital dispensary and obtained results which warrant a further trial of his method.

Of the 120 ambulatory cases reported by Dr. Brosius, treated in the outdoor dispensary, 89 were estivo-autumnal, 27 tertian, and 4 quartan, all of whom had positive bloods. His successes would indicate that the plasmochin treatment could be safely and effectively used with the cooperation of the laborers, which he was able to obtain. His routine treatment consisted of 0.02 grams of plasmochin and 1 gram of quinin for 4 days to all young people between the ages of 6 and 15 years. Adults received 0.04 to 0.06 grams of plasmochin daily and 1.5 to 1.75 grams of quinin. On the eighth day they returned for a second blood examination and four days more medicine. On the fifteenth and twenty-second days this was repeated.

On the eighth day, or the first repeated examination, only 19 (15 aestivo-autumnal, 3 tertian, and 1 quartan) out of the 120 cases showed positive blood. On the fifteenth day, or the second repeated examination, only 4 had positive bloods, all estivo-autumnal infections; on the twenty-second day, or the third repeated exami-

nation, 2, both estivo-autumnal, were positive; and finally on the twenty-ninth day, or the fourth repeated examination, all were negative.

The importance of good living conditions and proper nutrition in the treatment of chronic malaria cannot be too highly stressed. The food must not only be adequate in quantity, but of a character which furnishes the proper amount of protein, fats, carbohydrates, and inorganic salts, balanced as to the alkaline and acid character of the ash, and also containing the necessary vitamin values.

We recommend that chronic cases should be kept under observation and tonic treatment instituted after the blood becomes parasite free, until the physical condition of the patient is normal. The tonic treatment used by the United Fruit Company is a combination of quinin, iron, arsenic and nux vomica. The amount of quinin in each tablet is 2 grains, and 4 to 6 tablets are administered daily.

To make the above program of malaria control effective, we must have intelligent cooperation and this can only be brought about by teaching our people the essential factors of malaria infection, transmission, prevention, and cure. Undoubtedly this can be most effectively done in our elementary schools, and should constitute a compulsory part of the educational program. In this way within a few years the whole population in malaria infected districts would be sufficiently enlightened on the major problems of malaria control to know how to take care of themselves, and as self-preservation is one of the first laws of nature, the outcome could not help but result in efficient malaria control.

SUMMARY

(1) Malaria is a disease which affects man and certain anopheline mosquitoes.

(2) Individual susceptibility to infection is a variable factor.

(3) A constructive program for malaria control must be directed toward mosquito destruction and the cure of the human carrier.

(4) Short-radius sanitation about habitations with larval destruction is indicated, also.

(5) Adult mosquito destruction in habitations by insecticide sprays.

(6) Quinin is mainly effective against the asexual forms, but favors the development or appearance of the estivo-autumnal gametocytes in the peripheral blood.

(7) Plasmochin is mainly effective against gametocytes in the peripheral blood, thus rendering the human carrier non-infectious to mosquitoes. Plasmochin, however, produces toxic symptoms in some individuals, which circumscribes its usefulness.

(8) Good living conditions and a properly balanced adequate diet are important allies in the cure of malaria.

(9) Education of the inhabitants of malaria infected communities in control measures is strongly recommended and essential to effective malaria control.

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Discussion follows paper of Dr. Barber, page 732.

TREATMENT OF MALARIA WITH PLASMOCHIN*

By WILLIAM KRAUSS, M.D.,†
Memphis, Tenn.

Heretofore our only means of controlling malaria carriers consisted in preventing the production of gametes by giving quinin continuously until the mature gametes had died out. This is a slow process, requires too long a time for detention in a hospital, and the after-treatment by

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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the patient himself has been found so unsatistory as to be worthless.

Another pressing problem has been that of relapses. With these two exceptions quinin has been and is a very satisfying specific.

When plasmochin was offered as a succedaneum to quinin these two therapeutic problems naturally claimed the most attention.

Plasmochin is offered in two forms, plasmochin plain, in tablets of 0.02 grain (1/3 grain), and plasmochin compound, containing 0.01 grain plasmochin and 0.125 grains quinin sulphate in each pill. The former is recommended for the treatment of tertian malaria and for gametes, the latter for estivo-autumnal malaria.

The cases here reported were studied at the Memphis General Hospital, which is under the control of the clinical staff of the College of Medicine of the University of Tennessee. All the patients and charts were studied by the writer in his capacity of consultant in Tropical Medicine. About 800 thick and thin smears were examined in person in order to make the study authentic and reliable. This study would not have been possible without the enthusiastic cooperation of the clinical staff. I am especially grateful to Dr. W. E. G. Bayley for his help with the patients and histories and for abstracting the histories for tabulation. I wish also to express my thanks to Winthrop Chemical Company for the generous supply of plasmochin. There were 98 cases in this group but some histories had to be rejected for different reasons. The list does not include cases of pernicious malaria, nor some others not deemed suitable for tabulation.

We had a very satisfactory background for our studies in the experiments we have been making on a small selected group each year for the past four years. These experiments were made for the purpose of checking up the various individual preferences of prominent tropical workers such as, the Canal Zone method, the Ross plan, our one-time honored "10 grains three times a day" (the sulphate in 5 grain capsules), and the alkaline treatment advocated by Sinton, and Fletcher. Our house staff is very much pleased with the modification of the old "10 t. i. d.," by giving an effervescent bicarbonate one-half hour before each dose of capsules.

The tables here presented show the relative efficacies of the two forms of plasmochin, contrasted with that of quinin, used in different ways. They represent what we have been able to find out by studying the clinical histories and the blood smears. In the plasmochin studies alone I examined all the slides, covering all check smears in thick films with a mechanical stage, using thin smears for studying morphology. Most of the quinin figures are from cases treated prior to 1927. We added a few cases of quinin treatment this year, cases not deemed suitable for trial of a new remedy. Our clinical material was not large enough to divide between quinin and plasmochin. It was felt there was no advantage in unnecessary repetition.

It must be admitted that an attempt to plan a practical treatment from a study of these tables would be difficult. These combinations of treatment were chosen in part to get information as to the range of usefulness of the combinations and in part because in the estivo-autumnal series quinin had to be added in the interest of the patient.

Plain plasmochin seems to be equal in potency to quinin in the treatment of benign tertian malaria. It removed gametes from the peripheral blood in less than six days, and in this respect it is superior to quinin. On the other hand, it is quite apparent that in choosing between plain plasmochin, plasmochin compound and plasmochin plus quinin, the practitioner is confronted with a complexity of therapeutic agents and combinations and with the trouble of determining species of parasites to guide him in his choice. We have evolved a routine applicable in all cases, which may be departed from according to indications. We suggest that the patient be put upon plasmochin at once. Quinin is added in suitable doses for the rapid control of the fever. Plasmochin can be safely continued in daily dose of 0.06, or 3 tablets of plain plasmochin for 10 days without risk of toxic symptoms. The after treatment is left to the choice of the practitioner with the recommendation that either quinin or plasmochin compound will be continued in full doses for 3 days of each week for a period of five weeks. Although arsenic is deemed valuable it is desirable to see how well we can fare without the use of a multiplicity of remedies.

The effect of plasmochin on the parasites, intracellular as well as mature gametes, is striking. The lithographs in the paper by Schulemann and Memmi are duplicated in the slides shown in the Exhibit Hall. We are not unmindful of the appearances known as quinin forms but we think we can distinguish between the two, and in any case "quinin form" could not apply to mature gametes.

In judging evidence of definite destruction

of the gametes we must take into account the possibility of visceral localization, as Darling has repeatedly pointed out in his advocacy of quinin prophylaxis for the purpose of driving gametes from the peripheral circulation. The writer is not prepared to take sides, either with Darling or with those who maintain that treatment tends to force the plasmodia into the sexual cycle and bring them into field of observation. Col. Sir Clayton Lane, in summarizing the results of War experiences with malaria strongly opposes the idea that one can at will change the infection from the schizont to the gamete stage.

In our charts there was no apparent difference between the fate of the gametes in the patients who had plasmochin alone and those who also had quinin.

We need now consider only the question of justification for regarding our gamete pictures as something entirely new and not heretofore observed.

Senile changes in gametes have been described by the earliest workers, for example Laveran, Thayer, Mannaberg. We have seen these, including vacuolization, when it was the practice to examine fresh mounts. We have also seen changes in stained blood, whether due to quinin or not. But whereas, before plasmochin such pictures were occasional we here find them to be the rule. I am sure that it is conceded that gametes persist for weeks under intensive quinin treatment. In our series treated with plasmochin, gametes were never found after nine days' continuous treatment.

I do not wish to be understood as holding that plasmochin has no place in the treatment of malarial fever. The tables show that in some cases it has proved quite efficacious. It will doubtless be useful where quinin is contraindicated. We have used it with success in patients who refused to take quinin because of real or alleged idiosyncrasy and to the great delight and relief of the patients. It is said to be without reaction in hemoglobinuric fever. We have not seen such cases in several years. Formerly we had as many as twenty to twenty-five in a single season.

I have omitted general citation of the literature because Dr. Barber is presenting a summary of the results of various investigators.

The concluding observations your essayist wishes to make are that we welcome plasmochin as a valuable addition to our armamentarium, especially in the interest of preventive medicine. We expect to use it routinely in our hospital along the lines suggested.

I believe it is now entirely feasible to require the isolation of malarial patients for ten days and release them freed of their gametes, but it seems there is not as yet a certain method for preventing production of new crops from residual schizonts. Since quinin is more active upon young forms I agree with Fischer and Weise that quinin is best for after treatment.

TABLE I

NO FEVER AFTER

		DAYS of TREATMENT									
		1	2	3	4	5	6	7	8	9	over	Total
TERTIAN	Quinin Bis. 10g. t.i.d.	14	3	3	–	–	–	–	–	–	1*	20
	" Sulph. "	33	16	7	1	–	–	–	–	–		57
	" " & Alkali	16	4	1	–	–	–	–	–	–		21
	Plasmochin. .1	5	15	10	2	1	–	–	–	–		33
ESTIVO-AUT.	Quinin Bis. 10g. t.i.d.	12	5	5	4	2	–	–	–	–	1*	29
	" Sulph. "	42	30	17	8	5	–	–	–	–		102
	" " & Alkali	17	7	2	1	–	–	–	–	–		25
	Plasmochin. .1gm	0	0	0	4	2	1	–	–	–		7
	" Comp. .5 tab.	2	8	3	4	2	1	2	1	2	1*	26
	" + Quin. Sulph	1	2	5	2	3	–	–	–	–		13

* See Explan.

TABLE II

PLASMODIA ABSENT AFTER

	DAYS of TREATMENT										
SCHIZONTS	1	2	3	4	5	6	7	8	9	over	total
Tert.. Plasmochin, 5x .02	3	9	10	5	1	2	–	–	–		26
" " & Quin, grs 30	2	2	3	1	–	–	–	–	–		7
E-A.. Plasmochin, 5x .02	0	0	2	1	1	2	–	–	–		7
" " Comp. .06 + gr 15	0	0	0	5	6	7	5	1	–	1*	25
" Plasm. .1 Quin. gr. 30	2	5	2	0	1	1	–	–	–		13
										Total,	78
GAMETES											
Tertian. Plasm. .1 daily	0	4	8	7	1	–	–	–	–		20
E-A.. Quin. + " "	1	1	2	2	0	0	0	1	–		7
" Plasm. Comp.	2	0	1	2	2	1	2	0	1		11
										Total,	38

* Relapsed, tertian, after 17 days.

TABLE III

Quinin Intolerance Cases

1 tertian malaria vomited repeatedly after quinin, took plain plasmochin without discomfort.

2 cases tertian quinin intolerance made a good recovery without symptoms on plasmochin plain.

TABLE IV

Toxic Symptoms

1 case tertian malaria, after 38 tablets plasmochin compound, epigastric burning.

1 case, tertian and E-A, after 33 tablets plasmochin plain and quinin, cyanosis.

1 case, tertian, after 28 tablets plain plasmochin, cyanosis.

1 case tertian, after 27 tablets plain plasmochin, cyanosis, vomiting, epigastric pain.

1 case, estivo-autumnal after 31 pills plasmochin compound, pyrosis.

With respect to the toxicity of plasmochin, we must admit that the margin of safety is perhaps too low for general use.

This is a matter that should be settled in conference by those who are in position to speak authoritatively.

I have presented only a few of the highlights of the results of my studies. Time does not permit my going into detail.

Discussion follows paper of Dr. Barber, page 732.

REPORT OF THE SUB-COMMITTEE ON MEDICAL RESEARCH*

By M. A. BARBER, M.D.,†
Greenwood, Miss.

One of the most important new things in the treatment of malaria is the synthetic drug, plasmochin. Two members of this Sub-Committee have done extensive work on its use during the past year. Summaries of their work follow:[1] [2]

The experiments recorded confirm and extend the results obtained by Roehl (1926) on the action of plasmochin on malaria in birds. Daily doses of 1.5 mg. given orally are effective but are not easily tolerated by the birds. Heavy doses of 1.0 mg. and 0.5 mg. given daily for five succeeding days after a single inoculation prevent acute infections but do not prevent the appearance of parasites in the blood. Similarly smaller doses of from 0.07 mg. to 0.2 mg. given on five successive days after parasites appeared in the blood prevented acute infections but not the continuance of parasites in the blood. Daily small doses of plasmochin (0.1 mg.) prevented the appearance of parasites in the blood of birds that were at the same time given daily inoculations of parasites. Plasmochin in doses of 0.1 mg. for two weeks prevented the death of birds with acute infections that were deprived of large quantities of blood. The death of a bird suffering from a severe relapse was also apparently prevented by daily doses of 0.1 mg. for two weeks. Plasmochin is thus shown to be a very effective therapeutic agent in bird malaria. It does not, however, destroy all the parasites in the body of the host and hence does not free the host from the possibility of relapse. On this account efforts should be continued to discover a drug that will destroy all of the parasites and hence prevent what is probably the greatest single factor in the spread of malaria, relapse.

SUMMARY

Plain plasmochin is effective only in tertian malaria and for gametes.

Plasmochin compound is inferior to quinin for the control of fever in estivo-autumnal malaria.

We found it expedient to add quinin in ordinary therapeutic doses.

Plain plasmochin in daily doses of 0.1 grain or over tends to produce cyanosis in from 5 to 10 days. This was severe in one case.

Plasmochin compound seems to be safe for field work and for administration in public health clinics. In doses of 5 tablets daily for 10 days it will probably destroy all gametes.

For this reason we think that all cases of malaria should be under quarantine restrictions until the 10 days treatment has been carried out, adding more quinin if needed to control the fever.

This will insure a more prolonged treatment and in this way only will operate in reducing relapses.

There is the probability that plasmochin and quinin in judicious combination will increase the efficacy and reduce the cost of the therapeutic end of malaria control.

(The Chairman of the Sub-Committee gave a few notes on plasmochin treatment in Mississippi and New Mexico. A chart was shown summarizing the literature on plasmochin and plasmochin compound as used in the treatment of human cases.)

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DISCUSSION (*Abstract*)

Papers of Dr. Deeks, Dr. Krauss and Dr. Barber.

Dr. Wm. E. Deeks, New York, N. Y.—The Winthrop Chemical Company recently advised that they are not yet ready to place the drug on the market, and would not therefore submit a price. The German firm advised me that they would submit a price which would bring the cost of treatment with plasmochin a little lower than with quinin at the present market price of the latter drug.

I recently bought 100,000 tablets, shipped from Germany, but have not yet received a bill for them.

If any of you are interested in the treatment of malaria with this drug and will write to the Winthrop Chemical Company, I am sure that they will send you literature and furnish you with a supply for trial, providing you agree to render them a report on the results that you obtain. They are very generous in that respect.

Dr. A. T. McCormack, Louisville, Ky.—It seems to me that we should not let this occasion go by without expressing our gratitude to the United Fruit Company for its very effective scientific work, which has meant much to the South and to the problem of malaria in the whole world.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Special Expert, U. S. Public Health Service. Chairman, Sub-Committee on Medical Research, National Malaria Committee.

Dr. Krauss (closing).—Those people who have had experience in the treatment of malaria with quinin need not seek further information as to what quinin will do to gametes, no matter how many we examine this year, or next year, or the year after.

A prominent eye, ear, nose and throat man requested me to announce to this Section that the amount of harm that is done by the insanely large doses of quinin formerly given with respect to bone and air conduction is incalculable, and that the excessive use of intravenous injections should be condemned. This also applies to arsphenamin. Some physicians are rather quick with the needle, especially in the use of those two drugs.

Dr. Deeks (closing).—This paper covers practically all of the work done last year, and published in our 1926 Annual Report. We have used plasmochin much more extensively this year than last. One of our medical superintendents alone, has treated some 400 cases of malaria with combined plasmochin and quinin, keeping them under observation from six to eight months. At the close of this year, we expect to compile and publish another report that will show the results obtained in a large series of cases which have been observed this year. The conclusions I have given you are based on observation and experience that we have gained since the material for our 1926 Annual Report was compiled for publication.

I have here with me some samples of plasmochin and plasmochin compound which were furnished me by the Winthrop Chemical Company of New York City, the authorized agents and distributors for the German manufacturers.

A representative of this Company told me that they would furnish, free of charge, sufficient quantities for trial purposes to members of this Society, who desire to try it out in their practice.

With reference to the remarks about comparative experiments, I will say that this has been done. Dr. Cordes of Preston Hospital, Preston, Cuba, took a series of 72 cases of malaria half of which were given the usual quinin treatment and used as a control; the other half being treated with plasmochin compound. The majority of the cases in each group either had gametes in their blood on admission to the hospital, or they developed during treatment. In the majority of cases treated with plasmochin compound the gametes disappeared from the peripheral blood in from four to six days, and with one exception all of them were free from gametes after the eighth day. This one exception was free after the ninth day. The opposite was true of the quinin treated cases: in the majority of these gametes persisted in the peripheral blood after the eighth day, and in some of them who were observed for a longer period, the gametes still persisted at the end of two weeks.

Patients differ regarding their idiosyncrasy to plasmochin. Some of them seem to be able to take double the dosage ordinarily recommended without any disturbance whatever. The untoward symptoms usually consist of either a little nausea, or some gastric disturbance, or a slight cyanosis of the lips. Most patients can take a larger quantity of the drug than the dosage usually recommended without disturbance. Others are very susceptible; but all can take it if it is given under proper precautions. Intelligent patients under direct observation at proper intervals, can be given with safety, a sufficient amount of plasmochin compound to take home with them, and to last them for a period of four days. They should then return in from seven to eight days for another four days' treatment. In nearly all cases this procedure will clear their blood of gametes, and thus render them non-infectious.

In Ancon Hospital during the construction period of the Panama Canal, we often discharged as many as 80 to 100 patients a day, who had been admitted for malaria and who were free from symptoms on the day of discharge. We thought we had cured their malaria. Later we found by checking them up with Ross's thick film blood examination that from 8 to 15 per cent of them were being sent out as carriers of malaria. With the quinin treatment we were preparing many of our patients for the spread of malaria.

I think, as Dr. Krauss has said that plasmochin is not only a permanent additional therapeutic agent for the treatment of malaria, but is one of the most valuable discoveries since the introduction of quinin.

PERNICIOUS MALARIA*

By WILLIAM KRAUSS, M.D.,†
Memphis, Tenn.

First we shall take up cases of quinin fastness.

One of these was a negro who persisted in having parasites in his blood no matter what we did. One morning the nurse found a handful of quinin capsules under his pillow. Whenever we do not get a reaction with Mayer's reagent in the urine we know quinin is not being taken. There is no third way about it. In such cases we give it in solution. We had four patients with four-plus Wassermann reactions, one with urticaria who could not take very large doses, and one patient with diarrhea who did not hold it in his intestinal tract long enough to have it taken up. Two cases were complicated with pneumonia.

When there is a complication, the parasites may actually persist under intensive treatment. We had two patients with pyelitis, one with an antrum full of pus, one case of primary syphilis with fever, one of general adenopathy, one with a maxillary sinusitis, typhoid fever and malaria, who recovered. We had other cases of throat infection, malaria associated with typhoid fever, and other conditions. We say when we do not get results from quinin in malaria that the patient is not taking it, or there is some complication.

We had seven patients in profound coma, of whom two died and five recovered. We had three patients with wild delirium, two with other forms of pernicious malaria, two with symptoms simulating typhoid fever, and three cases of

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*Clinic, Clinic Session, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Professor of Tropical Medicine, University of Tennessee, College of Medicine, Memphis, Tennessee.

abortion due to malaria. One of these patients died because malaria was not suspected.

A negro boy, aged 10, well nourished, was unconscious for twenty-four hours. We gave him 100 c. c. of 5 per cent alkaline glucose solution, intravenously, twice. He was in the pediatric division and they do not like to give quinin intravenously. They gave it intramuscularly, two doses. The patient recovered consciousness and finished treatment orally.

A white man, aged 63, was picked up in a comatose condition. Tertian parasites were found. He was given two doses of five grains each intravenously because he could not swallow. After consciousness was restored we were able to complete the treatment by mouth. This was interesting because the delirium and coma were apparently due to the tertian parasites.

It is not our custom to give quinin intravenously in large doses or at all, if we can help it. If you have a patient in an asthenic condition and give 15 grains intravenously you are almost sure to have a death. I have seen three deaths like that in the last three years. Dr. Maxcy of the United States Public Health Service, studied a number of cases that were being treated here at the Marine Hospital, and found the blood pressure depressed alarmingly after 15 grains intravenously. If you give smaller doses and repeat them you have no trouble.

A negro patient in wild delirium required massive injections of morphin, ice cap and salts to control him, but he finally became rational. On inquiry we found he had fallen out while throwing a ball at an amusement park and it was believed that he had meningitis. Blood examination which is done routinely showed that he had pernicious malaria. After he regained consciousness he could swallow, and he recovered under the usual treatment.

A white man, aged 19, with double malaria, was admitted in coma. He could be aroused to take his medicine, and finished satisfactorily on the routine treatment, without any difficulty. We learned later that this was his third chill. We think such rapid development of perniciousness after three chills is a recrudescence of latent malaria.

In the fatal group both patients were asthenic, and made no response to any form of stimulation. There was no marked degree of pyrexia. One of them died in eleven hours and one in fifteen.

The first patient was a white man, aged 24. His brother informed us that he had had malaria for six months. A week before a mule had kicked him and caused a fracture of the radius which had never been reduced, and that was the beginning of the pernicious phase. His temperature on admission was 101°F., and he was in typical asthenic coma. All kinds of symptomatic treatment were employed without the slightest result. Quinin was given intravenously in safe doses frequently repeated.

The other patient was a white man, perhaps 60 years old, who was picked up on the street in a typical asthenic coma. He had an old osteomyelitis of the knee, and a heavy infection of estivo-autumnal malaria. All kinds of symptomatic treatment were employed to hold him up until quinin could get in its effect but without result. He died in eleven hours. These were really cases of agonal coma and probably no results could be expected by any method of treatment.

We think an intravenous injection of sodium bicarbonate opens up the blocked vessels and allows the solution to have more effect. One thing to remember is to give these patients alkalies even if you do not do anything else. We think this accounts for the recovery of some of our desperate cases.

In one case, that of a white man, aged 50, the temperature did not rise to normal until the third day after admission. He gave a history of quotidian malaria, with vomiting, diarrhea, cold, clammy skin, and very faint pulse. This patient was conscious and rational, which is always the case with this algid type of patient. On account of vomiting he was given five grains of quinin intravenously every three hours for three doses, and then received it by the routine method. Alkalies were pushed to the limit, and this patient made an uneventful recovery.

Another case of the gastro-intestinal type was admitted with a bilious fever. These patients have usually been sick a long time before they reach the hospital, and often terminate fatally on the first day. If we can hold them for twenty-four hours we have them saved. This case shows the prompt effect of alkali treatment, for there was a complete clearing up of gastro-intestinal symptoms and the patient made a rapid recovery.

One patient was brought in with hiccough. We do not know yet what the cause of the hiccough was, but we examined the blood and found malarial parasites. We cured the malaria, and the hiccough subsided. Whether it was due to the malarial infection or subsided spontaneously I am unable to say.

A colored woman was admitted to the Gynecological Department of the hospital following abortion. Gas gangrene was suspected. The woman was apparently toxic, jaundiced, the urine was dark and smoky, and she was comatose. While Dr. Michelson was taking blood for the culture, he made a smear and found an abundance of estivo-autumnal parasites. He gave her quinin intravenously with some glucose, followed by sodium bicarbonate and although this woman looked as though she would die within a few hours she recovered.

The malaria was the original cause of the abortion and was not recognized until she became comatose. The Welch bacillus symptoms were due to malaria. We lost one white woman with such a history and saved another.

On the surgical side we are just getting the reverse of the attitude we used to have twenty-five or thirty years ago when we treated everything as malaria.

Many cases of comatose malaria and other pernicious malarias, are allowed to end fatally; partly because we fail to make a proper diagnosis, partly because we do the wrong things. The one great wrong is to give immense

doses of quinin intravenously. All you can do with quinin is to prevent the invasion of more red blood corpuscles. It is the harm the malaria has done that you have to consider. In such cases certain vascular areas are completely shut off and the quinin does no good. If you give alkalies you open up these areas and according to Sinton you also facilitate absorption.

Another point is to obtain satisfactory elimination through the intestinal tract. I think one of these fatalities might have been prevented if we had given transnasal gavage with saturated solution of magnesium sulphate.

LENGTH OF LIFE OF ANOPHELES QUADRIMACULATUS AFTER BEGINNING OF CONTROL OF PRODUCTION*

By L. L. WILLIAMS, JR., M.D.,†
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and
A. E. LEGARE,‡
Columbia, S. C.

As summer approaches, anopheles production commences long before temperature and other conditions are favorable for the convection of malaria. When larvicides are used to control anopheles production as a malaria preventive measure much material is wasted in destroying early broods. In many areas, malarial infection in the mosquito does not develop before late June or early July, whereas anopheles emerge throughout April, May and June.

Therefore it is important to determine the time interval which must elapse between the first larvicide application and virtual disappearance of adult Anopheles.

A number of observations on this point have been made from time to time, and those few made by the authors are here gathered and presented in an attempt to elucidate this point.

TOANO POND, VA.

Toano Pond, in James City County, was observed to be heavily infested with larvae of *Anopheles punctipennis* during the latter part of June, 1924. The breeding was confined to a rather heavy rim of floatage around the entire edge of the pond. On June 30 the pond was lowered about twelve inches. This stranded floatage on the bank left a perfectly clean edge, and larvae disappeared from the water. The usual roosting-places nearby were kept under observation for the two weeks following. Adult anopheles rapidly disappeared and the last one was caught on July 12, twelve days after lowering the pond. For the balance of the season, no anopheles were found in this area. There were no other production areas within a mile and a half of this place.

WARE'S POND, VA.

Ware's Pond, in James City County, was under continuous observation during the summers of 1924 and 1925. In 1924, the pond was raised considerably, prior to the breeding season, and then lowered about the middle of June. This cleaned the bank and no anopheles larvae were found in the pond. Early in September, the miller replaced the baffle board in the spillway, raising the water into the grassy edges, and two weeks later anopheles larvae appeared among this grass. One week later adults took the wing and were found roosting in the nearby sheds, hen-houses, and pig-sties. In other words, two weeks after conditions were favorable larvae appeared, and three weeks after conditions were favorable, adults appeared.

The following year (1925) the pond was in excellent condition until August. At that time the dam washed away. Upon its repair, enough water flowed into the pond to raise the level just sufficiently to resuscitate some aquatic growth which was a very excellent harborage for anopheles larvae. Seven days later larvae appeared among this growth, and in sixteen days adults were on the wing.

LAKE PRINCE, VA.

Lake Prince, in Nansemond and Isle of Wight Counties, Virginia, was under continuous observation during the summers of 1924, 1925 and 1926. The salient observation was made during August of 1924, as follows:

On August 20 the flood gates were opened and the lake level began to fall. Floatage and most of the larvae were stranded almost immediately. Within a few days all larvae had disappeared from this lake. The roosting adults were caught in a negro house and adjoining stable as follows:

Date.	No. Roosting Quads.
Aug. 20	138
Aug. 24	20
Aug. 27	17
Sept. 3	13
Sept. 11	5

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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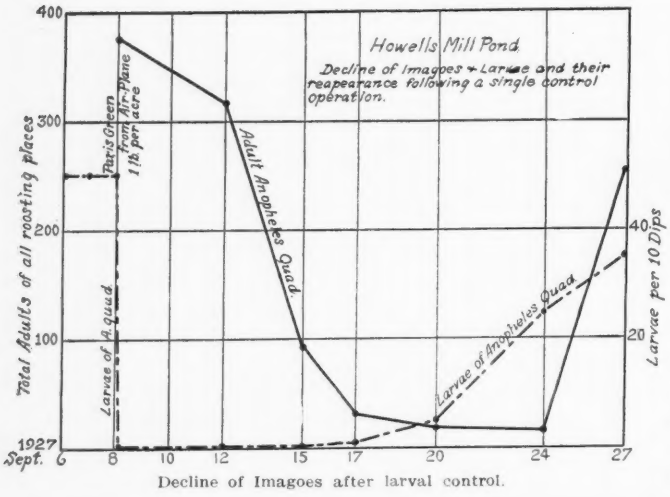

Decline of Imagoes after larval control.

QUANTICO, VA.

At Quantico, Virginia, during the summer of 1926, airplane Paris green dustings were successful in controlling production of *Anopheles quadrimaculatus*. There was one break during the middle of the season. Quantico Bay should have been dusted on August 10, but was not dusted until August 17. On that date, for every four larvae taken, one pupa was caught. These hatched and produced a moderate infestation throughout one-half of the camp. This infestation of adult mosquitoes lasted almost exactly ten days.

It is interesting to note that this infestation appeared on August 19; the effective control measure prior had been applied on the fifth. That means that adults reappeared fourteen days after the last effective dusting.

DISCUSSION

The above observations, though incomplete, indicated that: following control measures, the adults present disappeared in ten days, thirteen days, and twelve days respectively; that larvae returned in quantities to the breeding ground in seven days and fourteen days, respectively; adults reappeared after the last application of control measures in fourteen days, sixteen days and twenty-one days, respectively. The most important fact is that after cessation of control measures, adults may be expected in two to three weeks. None of the above observations was complete, in that at no single place could we observe the relation between number of adults and number of larvae in the water; the disappearance of both following a control operation; and the return of both subsequent to cessation of control measures. These conditions are fulfilled in the last and most important observation, which was as follows:

HOWELL'S MILL POND, S. C.

Howell's mill pond, in Bamberg County, South Carolina, is a small impounding of 500 acres in a nearly uninhabited part of the country. Trees and brush were never cleared from the basin prior to raising the water. Breeding of *Anopheles quadrimaculatus* was excessive, and adult infestation in the roosting places near the dam was very high. On September 8, 1927, this pond was used for a demonstration of the feasibility of controlling production by means of Paris green applied from an airplane in spite of heavy vegetation. The pond was dusted with a pound of Paris green to the acre with entire success.

Subsequent to the dusting, regular observations were made of roosting adults, and regular dippings were made in the pond for a period of time, with the following results:

	1		2		3		4		5		6		7		Total Anop.
	m	f	m	f	m	f	m	f	m	f	m	f	m	f	
9-12	75	45	1	1	34	26	25	13	9	6	35	21	15	5	315
9-15	14	10	0	0	12	6	5	3	3	1	20	8	4	1	87
9-17	3	0	1	0	0	1	1	0	2	4	3	12	5	2	34
9-20	3	0	0	0	0	0	0	0	2	2	3	5	3	3	21
9-24	1	0	0	0	2	3	1	0	0	0	4	2	3	2	18
9-27	5	3	5	4	2	1	10	6	21	23	60	49	50	37	276

No. 1—Hollow Tree—25' W. Bridge.
No. 2—Under Bridge—West Side.
No. 3—Under Bridge—East Side.
No. 4—Hollow Tree—25' East Bridge.
No. 5—Spillway—West Side.
No. 6—Spillway—East Side.
No. 7—Spillway—Center Beam.

Turned cool on Aug. 19.
Cool Aug. 24.
Warm Aug. 25.

Table of dips made:

Date.	No. A. larvae per 10 dips
Sept. 6	50
8 a. m.	50
8 p. m.	0
10	0
12	0
15	0
17	2
20	5
24	25
27	35

The above tables show that subsequent to the day of dusting (i. e., the day of larval extermination) a period of sixteen days could have elapsed safely before the second dusting and yet have controlled production from this pond. It is also shown that, following the day of dusting, the adults had practically disappeared in nine days and were still scarce sixteen days after dusting.

CONCLUSIONS

These observations in general indicate that larval control need not commence earlier than ten days prior to that date on which adult control is necessary. At the end of the season, larvicide need not be applied later than two to three weeks before that date after which adult control is no longer necessary. In other words, if epidemiological evidence has shown that conditions are not suitable to the convection of malaria prior to, say July 1, then larval control need not be practiced earlier than June 20. If temperature conditions are no longer suitable to the convection of malaria by October 15, then September 25 is the latest date on which one need apply larval control measures.

DISCUSSION (*Abstract*)

Dr. M. A. Barber, U.S.P.H.S., Greenwood, Miss.—Last summer in northern New Mexico we did an experiment to determine the growth rate of anopheline larvae in the comparatively cool waters of that region. By means of Paris green we thoroughly destroyed the anopheline larvae of a certain lagoon. Then at frequent intervals we revisited the place and made collections of the new broods of larvae to determine the growth-rate and increase in numbers. As a further check on anopheline production we used a trap for adult mosquitoes consisting of a barrel sunk in the bank of the lagoon. The slow growth of the larvae indicated that in these waters fully two weeks would be required for the growth from egg to adult mosquito, and that probably a Paris green treatment twice a month would suffice even in midsummer for the control of anopheline breeding in this lagoon.

MALARIA SURVEY IN IRRIGATED REGIONS OF RIO GRANDE RIVER NEW MEXICO*

By M. A. Barber, M.D.,†
Greenwood, Miss.

Two regions were surveyed during the summer of 1926 and 1927:

(1) A region near Espanola, northern New Mexico, with an elevation of about 5,600 feet above the sea. There malaria has been endemic for many years. A high endemic index occurs in certain villages, principally among Spanish Americans and Pueblo Indians. Only the benign tertian type has been found there.

(2) A region in southern New Mexico, elevation about 3,800 feet, where malaria has considerably increased during the past three years. Many cases occurred during the late summer and autumn of 1927. Both benign tertian and estivo-autumnal types were found.

In both regions anopheles are very abundant. The chief breeding places in the northern region are ancient beds of the Rio Grande and wet pastures or meadows supplied with water from irrigation ditches; in the southern region, in drainage ditches dug to prevent oversaturation of the soil with water.

Drainage, of a comparatively inexpensive type, would effect a great reduction in breeding places in the wet pastures and ancient river beds. The removal of aquatic vegetation would much reduce the production of anopheles in the drainage ditches, a remedy very expensive and at best temporary. The use of Paris green would be feasible in all of the breeding places along the Rio Grande in New Mexico. Gambusia seemed to be absent in most of the valley. We introduced two species during the summer of 1927. One species had begun to multiply in September.

A large percentage of the dwellings in both regions are screened. The use of quinin is probably not so common as among people in the malarious regions of the Southern and Southeastern states. The further encouragement of early treatment of cases would probably materially reduce malaria in the Rio Grande Valley.

It is evident that malaria must be taken into account in the development of reclamation work in the arid regions of the Southwest.

Our survey is part of a general study of the problems of malaria in the irrigated regions of the southwest. A more extensive publication will follow.

DISCUSSION (*Abstract*)

Dr. T. H. D. Griffitts, Biloxi, Miss.—Dr. Barber spoke of the type of malaria in the upper area as being estivo-autumnal and in the lower one benign tertian. Did there seem to be a relation, pronounced or otherwise, between the prevalence of a certain species of anopheles and the species of parasites found?

Mr. J. A. Leprince, Sen. San. Eng., U.S.P.H.S., Memphis, Tenn.—I should like to ask Dr. Barber whether

*Abstract of paper read before the National Malaria Committee, meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Special Expert, U. S. Public Health Service.

the soil in the bottom of the drainage ditches, was muddy or sandy.

Dr. L. L. Williams, Jr., Surgeon, U.S.P.H.S., Richmond, Va.—What is the length of the breeding season in that section and what do you estimate as the season for malaria convection? With two hundred miles of ditch, with the use of the aeroplane, the number of dustings you have to put on is a matter of tremendous importance.

Dr. Barber (closing).—The soil of the region in southern New Mexico described is sandy, and the water in the drainage ditches is about 2 to 3 feet in depth, clear, and in many places rapidly flowing. *A. pseudopunctipennis* is the anopheline species most common in the portion of the ditch exposed to the sun, while in the vegetation-shaded margins *A. maculipennis* prevails.

The species of anopheles and character of breeding place in the region of southern New Mexico where benign tertion was most prevalent were essentially the same as that found in the estivo-autumnal region. Apparently the presence of the one or the other type of parasite depended on the carriers from whom the infection spread rather than on the environment or mosquito species. The county health officer believed that estivo-autumnal malaria was introduced by certain carriers from Oklahoma and Texas. Our examinations were made in August and September, the season in which estivo-autumnal malaria is most common in the southern states generally. It will be interesting to determine what type of malaria will be most common in relapsing cases next spring.

The warm season in southern New Mexico is relatively long, beginning in May and extending through September.

METHODS AND COSTS OF SCREENING FARM TENANT HOMES IN MISSISSIPPI*

POST FLOOD MALARIA CONTROL

By C. P. Coogle, M.D.,†
Greenwood, Miss.

The method of post-flood malaria control chosen by the American Red Cross officials and public health officers was to screen those houses in and adjacent to the flooded area, which were found to be housing malaria cases and potential malaria carriers. A big problem of detail had to be worked out. Calculations of the quantity of materials, of the labor cost and the time for construction were based on the scheme worked out and published by the U. S. Public Health Service,[1] from experimental work conducted in LeFlore County, Mississippi, during the three previous years. This work covered a total of 104 houses accurately measured and carefully observed.

As would be expected, there were certain local problems peculiar to the flooded sections of the states of Mississippi, Louisiana, Arkansas and Tennessee, and in this paper it is intended to discuss only some of the most important factors common to the entire territory.

The same scheme of selecting houses to be screened was adhered to in the entire flooded area. The number of houses per county was not equal, and there was a marked difference in group selections in each county where the work was undertaken. Even though the percentage of homes screened was low as compared with the malaria problem, the screening scheme did strike at the very heart of the malaria foci, and much relief was given.

The respective health officers assumed the responsibility for group selections, based on information of malaria prevalence, and the house selections were as well made in one county as in another.

The technic of selecting houses to be screened was: to visit the communities in which, from previous information, the health officer had good reason to believe that malaria was prevalent, or was more prevalent than in other communities. A visit was then made to the owner or manager of the plantations and explanation made of the purpose of the selective screening, that is, to screen houses in which there were malaria cases or suspected malaria carriers. With the assistance of the owners and plantation managers, homes were visited, tenants were interrogated, and the screening decided upon.

Diagrams were made of the houses showing the location and size of each window and door, and the relative position of the doors to the house on which they were to hang.

Wire screen was placed on the outside of the windows, the full length; therefore, in taking measurements for the windows there was allowed a 1-inch lap at the top, a 1-inch lap on each side, and a 2-inch lap at the bottom. It was through this lap that the wire screen was tacked to the window frame, with No. 4 canvas tacks spaced about 2 inches apart on the two sides and across the top, and two rows of tacks spaced about 2 inches apart across the bottom. In

*Abridgement of a paper read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17.

†Acting Assistant Surgeon, U. S. Public Health Service.

1. Reprint 1153, pp. 1101-1112, from Public Health Reports, April 22, 1927.

taking the measurements the exact number of inches in width and height was recorded on the diagram to represent the size of the wire screen to be cut to fit over each window.

All doors were made to hang and swing outward from the house. They were hung on the outside of the regular door facing, allowing a 1-inch lap on each side and a 1-inch lap at the top and flush with the floor at the bottom. When the screen door was properly hung, it was encased with 1x1-inch strips around the top and facing, thereby making a closely fitting screen door.

The majority of houses measured were slightly sagged, and in order to get the proper measurements a plumb bob was dropped from one side of the door and the measurements in inches from the bottom to the top of this plumb bob line were taken, which insured a screen door of the desired size to cover the opening and also allowed for the lap.

This method of house measurement proved very satisfactory. A total of approximately 20,000 doors were made and hung in the flooded area. There were 10,238 of this number made in Greenwood and used in the Mississippi Delta, east of the Mississippi River. The others were made in Arkansas, Tennessee and Louisiana and hung in the Delta sections east and west of the Mississippi River. Up to this time there have been no suggestions for improvement to warrant the changing of this technic of tenant house screening.

Method of Handling Doors.—After each door was made it was labeled with the house number and a letter corresponding to a similar number and letter on the diagram, which designated the opening the screen door was to cover.

The screen doors were made up in carload lots and shipped to each county. This greatly facilitated transportation and storage.

The timing of the field workers in taking the house measurements in Mississippi and factory workers in Greenwood in making up the doors was so accurately calculated that within four days after the measurements of the last house had reached the factory the entire group of doors had been completed, loaded for shipment and the screen door factory closed down.

Door Factory Routine.—The clerk copied on a typewriter each individual door measurement from each house diagram, using small pieces of strong window shade cloth in sizes 2x4 inches, on which was typed the name of the county, the plantation, the tenant, number of the house, the letter indicating the position of the door, the size of the door in inches, width and height, and the word "right" or "left" indicating the side of the screen door on which the hinges should be placed.

These identification tags were kept together in numerical order so that the carpenters, when cutting the door frame, could keep the door frame in proper order and the doors would not be mixed up at the factory. One of the tags was tacked on each door frame, so that the screen door might keep its identity from the time construction started until it was hung on the house for which it was intended.

Cutting the Lumber.—The sawyers selected the lumber, using choice straight lumber for the long or side pieces, top and bottom pieces and the less perfect lumber for the cross bars.

The ends of the top and bottom pieces and the long or side pieces were cut in a miter box at an angle of 45 degrees, according to the number of inches in length and width as shown on the identification tag.

The average number of door frames that one man could saw in an average day under normal working conditions was about 100.

Assembling the Door Frame.—These door frames were assembled on metal surface tables, the door frame being held in position by four sets of wedges. The cross bars were cut and added after the sides, top and bottom of the door frame had been assembled, thereby assuring the tightest possible fitting joints for the cross bars.

The lower cross bar was spaced 18 inches and the upper 36 inches from the bottom.

Sheet metal triangle plates, 24 gauge thickness, were nailed on the corners of the doors, and smaller plates, one-half the size of those used on the corners, fastened the cross bars to the door frame.

Screening the Door Frame.—The unfinished door frame was taken from the metal top table and placed on a supply rack, later to be moved to a hard surface table at the end of which was installed a rack to hold wire screen. When the door frame was in proper position on this table, the wire screen could be drawn from the roll and tacked to the top of the screen door frame.

By special arrangements of wedges, the wire screen was drawn tight and held in this taut position until it could be properly tacked to the

door frame with tacks spaced about 2 inches apart.

Metal triangular plates were placed on the four corners of the door and at the junction of the cross bars on the wire side, and all were nailed securely. Two sizes clout nails were used. During the first operation when the plates were put on the front surface of the door 1⅛ inch nails were used. This length permitted the points of the nails to clinch against the metal surface of the table. Shorter nails, one inch long, were used in all metal plates on the back surface of the door.

Lumber.—The lumber used in screen door construction was No. 1 cypress, 1 inch thick and 3 wide, surfaced only on one side. The smooth side was placed on the outside and the wire screen was placed on the back or rough surface of the door.

In hanging the door 3x3 inch loose pin butt hinges were placed 12 inches from the top and 12 inches from the bottom of the door. One-inch by 1 inch strips were used to encase the screen door.

Labor.—The output of the screen door factory was from 200 to 300 doors per day.

The number of men employed at the factory ranged from 17 to 22 and the minimum salary paid was $2.50 per day. The maximum was $4.50 per day, depending upon the kind of work to which the men were assigned.

Extra work was offered the men on a piece basis of 23 cents per door for all doors that were made above 200, which was specified as a day's work. This scheme assured that 200 doors would be made each day, and each man was enabled to add from 50 cents to $2.00 per day to his earnings by working more hours.

Metal Corner Pieces.—The galvanized sheet metal plates that were used on the corners of the doors on the front and back surface, and also used to join the cross bars to the door frames, were cut from long strips of 24-gauge double-plated galvanized sheet metal. They were cut into small squares 6x6 inches and these were sheared diagonally into triangles. The smaller metal plates were triangular in shape and one-half the size of the larger corner plates.

Costs.—The cost of the lumber delivered at the factory averaged 47 cents per door. The hanging strips averaged 10 cents per door. The cost of the 1x1 inch strips to encase the screen doors averaged 4 cents per door. The cost of the clout nails was in the neighborhood of 1 cent per door. The cost of the common nails to fasten the strips to the door casing was about 1 cent per door.

Cost of Hanging Doors and Screening Windows.—The average labor cost for hanging screen doors in LeFlore County was 35 cents each. The average labor cost for screening windows in LeFlore County was 5 cents each.

A large proportion of the doors was hung by carpenters who received from $2.50 to $4.50 per day. Several hundred doors were hung by contract at 35 cents each.

Practically 90 per cent of the windows that were screened in LeFlore County were screened during the time that the house diagrams were made, and the average labor cost was about 4 cents per window.

Several hundred windows were screened on a piece basis at the rate of 8 cents per window, where the carpenter furnished his own transportation.

In one instance a fairly good, reliable negro carpenter earned $40.70 in eleven days, hanging 90 doors at 35 cents each, and screening 115 windows at 8 cents each.

COST OF MAKING ONE SCREEN DOOR IN MISSISSIPPI

Hardware:			
Wire screen	$0.444		
Metal plates	0.079		
Clout nails	0.009		
Tacks	0.007	—$0.539	
Lumber	0.470	0.470	
Labor	0.240	0.240	—$1.249

COST OF HANGING ONE SCREEN DOOR IN MISSISSIPPI

Hardware:			
Hinges	$0.08		
Spring	0.05		
Door pull	0.02		
Hook and eye	0.01		
Screws	0.021		
Nails	0.01	—$0.191	
Lumber	0.230	0.230	
Labor	0.350	0.350	— 0.771
Total cost construction and hanging one door			$2.02

DISCUSSION (*Abstract*)

Mr. Alfred H. Fletcher, New Orleans, La.—On July 11, I went with Mr. J. A. LePrince to Greenwood, Mississippi to study methods and specifications for building screen doors and screening farm homes as worked out by the United States Public Health Service in Leflore County. Two days were spent at the shop and in the field with Dr. Coogle, who explained in detail every phase of the work. Therefore, our program in Louisiana was patterned after the Mississippi work.

As in Mississippi, the responsibility of selecting houses to be screened was placed on the health officer in each parish. Only one of the Parishes in which screening

was done could boast at that time of a full-time health unit. This was Ouachita Parish where the Director of the Health Unit selected the houses to be screened. The field bacteriologist for the Louisiana State Board of Health was located at Monroe at that time and was supervising the work of local Red Cross inspectors who had been appointed for a month's work. His offer to see the various health officers and use the Red Cross inspectors in locating the malaria carriers was accepted. Several different methods of selecting the houses were followed.

In Ouachita Parish, the physician and his nurse made a plantation to plantation and house to house survey, calling on the plantation owners, explaining the screening and malaria transmission, and securing assistance in locating malaria carriers on their plantation, living in homes that could be screened.

In Richland Parish, the names of malaria carriers were secured in the offices of physicians in the parish, together with information as to plantations on which they lived, the road, distance and direction from town. This information was then sorted out according to roads on which the houses were located.

In some of the other parishes, the houses were picked by the local Red Cross inspectors under the direction of the part-time health officer after the work had been explained to him by the State Board of Health representative who had offered to obtain this list.

Screening Windows.—The first main difference between our Louisiana program and the one in Mississippi was the fact that we carried on the entire program in the eight parishes in exactly the same manner as in the parish in which our factory was located. As in Leflore County, the first operation after securing the list of houses to be screened was to send out a crew of three or four boys with various widths of screen wire in their truck, together with all tools and hardware necessary for the screening of the windows At the same time, the house door measurements were taken. This enabled the boy in charge who made the house sketch, to explain to the tenant the purpose of the screening, the fact that they were taking measurements for doors to be constructed in Monroe, and when they might expect to get the doors to complete the work. As soon as the scene of operation changed to other parishes besides Ouachita, where the screen-door factory was located, it became necessary to pay living expenses of the men, which automatically changed the scale of wages from $2.50 per day to $5.00 a day. However, the usual method was to send two boys instead of the three or four and to hire inexperienced boys at $2.50 a day in the towns from which they operated.

When working in Madison, Tensas, East Carroll and West Carroll Parishes, the workers were a distance of from sixty-five to one hundred and forty miles out from Monroe. Three of these parishes are on the Mississippi River, which is about eighty-five miles from Monroe. In order to get to one of the parishes, namely East Carroll, it was necessary to go east from Monroe about forty-five miles, then north into Arkansas, and then northeast in Arkansas over some dirt roads, then south again to Lake Providence, a total distance of approximately one hundred and forty miles. Over 40 per cent of the houses which we screened were located in these four parishes.

Dr. Coogle stated that "from twenty-five to forty house measurements for screen doors and the screening of the windows on these houses by a carpenter and two assistants was an average day's work under normal conditions." In Louisiana, I think the best that a crew of three men was able to do was twenty-five houses in one day. These twenty-five houses were located on the main highway and very little time, comparatively speaking, was lost between houses, although the local Red Cross inspector went with the boys and interviewed the plantation owners and located the houses to be screened on that same day and assisted with the screening work whenever possible. On some days, not more than one or two hours were spent in actual screening work, the other eight or nine being spent in digging out of the mud.

Door Construction.—Fortunately, in Louisiana, the Superintendent of the Louisiana Training Institute at Monroe became very much interested in the work when it was explained to him by Mr. LePrince and myself. He offered to use his boys to build all the doors for us without cost to the Red Cross if we would furnish tables, and materials. A group of boys at this school is detailed to do all the carpenter work at the school under the direction of a professional carpenter, and this group, together with their instructor, was detailed to build the doors. The direction of the shop was left largely to the instructor as he was exceptionally interested in the work. After about three weeks' work by this crew of seven boys, the school barn was partially blown down by wind and for several days no work was done at the shop. As the repair work on the barn would take several weeks, another instructor was placed in charge of the shop and a new crew of boys was broken in. Toward the close of the work, it was found necessary to speed up and the crew was increased to fifteen boys. On some days as many as eighteen boys were working, who would turn out approximately one hundred and twenty-five doors per day.

So far as the shop and equipment was concerned it was very similar to the Mississippi shop, in fact, copied after it. But our door differs slightly from the Mississippi door because the top of our push bar is 41 inches from the bottom of the door. As the work neared its close, I had the opportunity of a visit to the Dyersburg factory in Tennessee and later used two devices which they had developed for speeding up the work on the table where the screen wire is tacked to the frame.

Delivering the Doors.—As the factory room was very small, it was necessary to deliver the doors almost as fast as they were built. The usual procedure was to sort and check the doors on the lawn just outside the factory, and load the truck in the late afternoon. The following morning, the truck would start out early, and the day was spent in delivering doors from house to house. This work proceeded quite rapidly when the houses were within thirty to fifty miles of Monroe; but when they were at a greater distance, it was necessary for the boys to stay overnight, and this, of course, meant living expenses in addition to their regular salary. For example, one boy started out early Tuesday morning with a load of doors to be delivered in East Carroll Parish. This was our longest haul, being nearly one hundred and forty miles. I expected that possibly a few of the doors would be delivered that afternoon, but received a wire the following day at ten o'clock stating that he had just arrived in Lake Providence and would start work immediately. The load consisted of about seventy doors. No word was heard from him Thursday, but late Friday night, he called by long distance phone from Eudora, Arkansas stating that he had burned out a connecting rod and the repairs would cost him $7.50. He had $8.00 in his pocket left from $35 ex-

pense money advanced to him before he left Monroe. It was necessary to wire him $10.00 to pay for board and room, and he reached Monroe about three o'clock Saturday afternoon. In addition to that, he had had a spare tire stolen, had lost off eight doors on his way over without knowing it, and had had other car trouble, also tire trouble. This story is told not only to show that the transportation expenses were considerable, but that delays from car trouble and so forth meant an increase in expense for meals and room as well as salary.

Sheet Steel Plates.—The original plan was to have these plates cut in Pine Bluff, Arkansas as the labor and use of squaring shears at the Training School would be free. However, the factory was changed from the school, and it was necessary to ship the sheets to us at Monroe. We rented squaring shears in Monroe, and cut the triangles ourselves. Dr. Coogle's average cost of metal triangles was 8 cents per door set. Our cost was 13.9 cents.

Lumber.—The cypress lumber cost $65.00 per thousand board feet, which made a cost of $0.55 per door against $0.42 per door in Mississippi. The cost of hanging strips and encasing strips was $0.19 per door in Louisiana and $0.14 a door in Mississippi. We used sixteen-foot lengths altogether in Louisiana and found the total waste to be very small.

Nails.—The cost of clout nails was $8.50 per hundred pounds in Louisiana against $7.50 per hundred pounds in Mississippi. We were able to keep a supply of 7/8 inch clout nails, but had to use three-penny nails in place of 1 1/4 inch clout nails for at least two weeks.

Hanging Doors.—The average number of doors which two men were able to hang in one average day in Louisiana was from thirty to forty. In other words, a carpenter and a helper would hang doors on ten houses for an average day's work. This seems to agree fairly closely with the Mississippi average of fourteen doors for one man in one average day.

Comparison of Unit Cost.—The average labor cost of hanging screen doors in Leflore County was $0.35 per door. The average cost in Louisiana was $0.357 plus $0.147 per door for meals and room, plus $0.216 for transportation. The average labor cost for screening a window in Leflore County was $0.05; in Louisiana, it was $0.25 for labor, $0.069 for meals and room, and $0.15 for transportation. This unit cost of screening windows also includes the cost of measuring doors.

Comparison of Costs of Material and Labor For Construction of Screen Doors in Mississippi and Louisiana Hardware:

	Mississippi	Louisiana
Screen Wire	$0.444	$0.515
Steel Plates	0.079	0.132
Clout Nails	0.009	0.019
Tacks	0.007	0.012
	0.539	0.678
Lumber	0.470	0.553
	0.240	Donated
Cost Per Door	$1.249	$1.231

Costs of Material And Labor For Hanging Screen Doors In Mississippi and Louisiana

Hardware:	Mississippi	Louisiana
Hinges	$0.08	$0.100
Springs	0.05	0.050
Door Pull	0.02	0.015
Hook and Eye	0.01	0.014
Screws	0.021	0.025
Nails	0.01	0.007
	0.191	0.211
Lumber	0.230	0.191
Labor	0.350	0.450
	$0.771	$0.852

Total Cost of Construction and Hanging per door,
in Mississippi $2.02
in Louisiana $2.083

In Louisiana we screened 653 houses at a cost of $13.90 a house.

R. E. Tarbett, United States Public Health Service, Little Rock, Ark.—In general the plan of carrying on the screening of farm tenant homes in the flooded districts of Arkansas was similar to that in Mississippi. The general plan of work as recommended was modified in some of the essential features without the knowledge of the originator of the plan. That these modifications had been made became evident only after the work had been authorized and appropriations made. These modifications made the carrying on of the work more difficult, less efficient, and more costly than would have been the case under the plan recommended.

The methods followed in the selection of the houses to be screened was not a satisfactory one, although it did allow for a rather wide distribution of screening within the counties selected. In only one of the sixteen counties within which work was carried on was it possible to rely on the county health officer to select the houses to be screened. In the other counties we were obliged to depend upon a local inspector, one to each county, employed for a temporary period and given about two days instruction with very little follow-up. The pay of these inspectors was not within our control and with four exceptions the men themselves were not of our selection. No transportation was allowed these inspectors and it was necessary to arrange as best we could for the local Red Cross chapters or others to furnish the necessary transportation.

These inspectors were instructed to obtain from local physicians and plantation owners or managers information as to possible malaria carriers: that is those who had been actually sick with malaria during the 1926 season. Right here we ran into complications. With very few exceptions the information obtained from physicians was of no value and it was necessary to fall back upon information received from plantation owners and managers. When they were told that it was the intention to screen the homes of malaria carriers then all of their tenants or "share-croppers" had had malaria. If we stated that it was the intention to take steps to prevent the spread of malaria without giving the method, then malaria was an unknown disease and no one had it. So many had been given typhoid vaccinations that as soon as malaria prevention was mentioned it immediately brought to mind the hypodermic needle. Because of these difficulties the work of locating and measuring homes of probable malaria carriers proceeded rather slowly during the early part of the work with a corresponding high cost. Later when malaria cases began to appear the instructions were modified so as to allow for the measuring only of houses within which a probable case existed. The work then speeded up.

The data obtained was similar to that as described in Dr. Coogle's paper, except that we did not obtain the number in the family under 15 years of age. We did however, obtain and record the names, sex, and ages of the probable carriers. In obtaining records carbons were used, the original copy being forwarded to headquarters at Pine Bluff and the carbon copy retained by the inspector.

A little different method of numbering was followed from that described in the paper, in that the doors for each house were numbered 1, 2, 3, etcetera, and this number was supposed to be chalked on the door casing, or side of the house adjoining the door, at time of measuring. At headquarters the doors were given a serial number irrespective of the county. During construction each door was tagged showing the county, owner, house occupant, house door number, size of door and the serial number of the door. In addition the serial number was chalked with black crayon in large figures on the door frame. When the doors were shipped a list showing the serial numbers for each plantation was forwarded the inspector.

Shipments were made in carload lots, the entire shipment for any one county including all screening material being made at once. Since the greatest number of doors to any one county was 617, one car per county was all that was required.

Under the plan of field work that was followed, and followed from necessity not choice, all the preliminary field work was completed at about the same time, causing in most instances a considerable loss of time between the completion of the field work and the start of actual screening.

Under the original plan all screen doors were to be made by the inmates of the Arkansas Boys' Industrial School, located near Pine Bluff, without charge for labor. This school had a large, roomy, wood-working shop, well equipped with wood-working machinery and a sufficient number of older boys ranging from 17 years to 21 years to have allowed for a maximum production within the limited time available. It was planned to construct 10,000 doors, the time limit for completion begin September 1. Material sufficient to construct between five and six thousand doors was delivered at the school and we were ready to begin operation on a full scale July 5. Up to the last week in July 1,076 doors had been made and it was very evident that the school had no intention of completing the number of doors required within the time set, and that not more than three thousand doors would be completed by September 1. It became necessary, therefore, to equip a shop, train a crew, and build the doors ourselves. Since no appropriation was made for labor, it was necessary to reduce the number of doors to be made and to apply the saving to labor costs. This made it necessary to reduce the county quota of houses accordingly.

The shop was started on August 1 and was operated for 25 days, during which time 6,228 doors were constructed, making the total doors constructed 7,304. After the first week, which was largely training and coordinating period, the shop was in full swing. Twenty-six young men were employed at the rate of $2.50 per day on an eight-hour basis. The actual working time per day was 7 1/2 hours, as a 15 minute recess was taken at 10 a.m. and 3 P.M. each day. With this recess we were able to maintain a constant speed, and it is believed that more doors were constructed per day than would have been the case with continuous work. After the first week a lower limit of 250 doors per day was set. The average, however, actually ran 276, exceeding 300 on some days and reaching 325 as the maximum.

The equipment was practically the same as described by Dr. Coogle, as was also the line-up of the men. One exception was that the metal reinforcement plates were punched for nail holes and the corners bent at right angles before they were delivered to the framing tables. It required five men for this work. It was found that in nailing the plates to the frames there was a tendency for the sharp points to stand away from the wood, by turning these points down at right angles to the plate they could be driven into the wood, not only offering a protection from these sharp points but also holding the reinforcement triangle in place while it was being nailed.

In the construction of the doors the upper crossbar was placed somewhat higher than was the case of the doors made in Mississippi. This bar was spaced so as to allow 20 inches between it and the lower bar, or 41 inches above the bottom of the door. This seemed to be about the average height necessary for protection of the screen wire when the door was opened by pushing with the hand and was at the height that would protect the screen wire when the door was opened by pushing with the side of the arm, in this case the bar striking the arm between the elbow and the shoulder.

The material for the door frame was of clear cypress dressed two sides to 31-32 inches. The facing strip for the hinges as well as the 1 inch facing strips were dressed one side to a thickness of 33-32 inches, the rough side going against the house.

The lumber was purchased as five quarter inch, rough, by broad, at a delivery price of $30.00 per thousand. Milling and stripping to the 3 and 1 inch widths cost $6.00 per thousand which included delivering from the mill to the shop which was located in a storage shed of the mill. This brought the total cost of the lumber delivered ready for use to $36.00 per thousand. The average amount of lumber necessary for the door construction as well as the facing strips and the small amount necessary in connection with the window screening was 14 board feet rough lumber, per door. In purchasing lumber "rough, by board," the waste is, of course, much greater than where definite length pieces stripped and dressed are purchased, since there is the waste in sawing and milling as well as the waste due to the varying lengths. This increase in waste, however, was in our case far offset by the low cost at which the lumber was obtained. Dr. Coogle gives the average lumber cost as 70c per door, whereas our cost was 49c per door.

The other material used in the door construction was similar to that described in the paper, except that with 31-32 inch material it was necessary to use 1¼ inch clout nails in order to obtain proper clinching.

In loading cars the doors were laid flat in stacking, each stack being as far as possible of approximately the same width doors. The facing to which the hinges were attached was nailed to the door frame for shipping. In stacking in the car, therefore, each door was reversed so that there was approximately 1¼ inch space, the thickness of the facing strip, between the wire of each door. This prevented tearing of the wire mesh and with the proper bracing allowed the shipment to go through without damage. In fact we had no reports of screens that were damaged in transit.

The screening material for each county was shipped to a central distributing point where arrangements were made with the local Chapter of the Red Cross to have the cars unloaded, the material sorted and stored. This was done under the direction of the county inspector, and where possible one of the officers of the Public Health Service assigned to the work was also present.

No arrangement was made in the original plan for the distribution of the material to the respective houses and it was necessary, therefore, to depend upon the plantation owner or house occupant to call for the

material. Notification that the material was ready for distribution was made in part by the inspector and in part by the local Red Cross. It was requested that this material be obtained at the earliest possible moment. It was found, however, that this material moved slowly and that when the work was being brought to a close a considerable amount of the screening material was still stored at the points of distribution. However, there was a waiting list in each county made up of planters who had become interested in the work and upon whose plantations, few if any houses were included in the first survey. These men supplied the information required and agreed to install such screening as might be assigned to them immediately. Such material, therefore, as had not been called for was issued to these planters and our records changed accordingly.

In the screening of the houses and the hanging of the doors it was expected that the greater part of the work would be done by the plantation owner, or house occupant, under the direction of and assisted by the inspector. It was impossible for the inspector working alone, and in only one county was any additional help given, to complete the work within the time set. In the greater part of the counties, however, the inspector did actually do a very considerable part of the screening, and as a general rule it was with difficulty that he was able to obtain necessary assistance required from the planters. Furthermore, the manner in which the material was taken out made the work more difficult since it was impossible to take up each plantation in its logical order.

As would be expected, some of the inspectors were able to obtain more assistance, or to accomplish more in the actual screening than others.

In Pulaski and Phillips County the installation of the screening was turned over in its entirety to the county health units and in three other counties assistance was rendered by the county units.

The manner in which the work was carried on makes it impossible to attempt to state the average number of doors which it was possible for one man to hang or the number of houses which one man could properly screen in a day. For the most part the inspectors reported 4 to 6 houses completed. The number, of course, depending upon the assistance rendered. The inspector working alone could average about four houses per day.

Both the cloth netting and the screen wire were used in screening the windows. Under the original plan the use of the cloth netting was compulsory. Approximately 12,000 yards of this netting was used. When this was exhausted, however, screen wire was used. In all forty per cent of the windows were screened with screen wire, this varying from 0 in some counties to 100 per cent in others. Paper and paste for scaling cracks and also small wire baskets made of the screen wire holding naphthalene balls for chimney protection were shipped to each county. The naphthalene balls were shipped in ½ pound paper bags, each bag holding the required amount for one basket.

The sealing of the cracks was left to the house occupant and it is not possible at this time to state to what extent this part of the work was completed, except in three counties. In Lincoln and Jefferson Counties the inspector required the house occupant to do this work while screening was going on, in Lincoln County, on the pain of not installing screens. In these two counties the houses sealed will probably run between 75 and 90 per cent. A report from Pulaski County gave 65 per cent as sealed.

The cost of materials and labor for the construction of screen doors averaged $1.52 per door, including all of the hardware and nails, as well as lumber for door facings. The average cost per house for complete screening, including estimates for the amount expended in money or labor by the planters, but exclusive of the supervision of the Public Health Service, was $10.00 per house.

The total number of houses screened was 2,348, requiring 7,304 doors, or an average of 3.11 doors per house, and the screening of 12,200 windows, with an average of 5.2 windows per house. It was noted that there was quite a difference in the number of doors and windows per house in the various counties, the door average ranging from 2.4 to 3.52, and the average number of windows from 4 to 6.7.

In the 2,348 houses, a total of 4,572 probable malaria carriers were reported.

The work was carried on in 16 counties covering 699 plantations, large and small.

While at the start of the work there did not appear to be great amount of enthusiasm on the part of the planters, considerable interest was aroused before it was completed and it is believed that there will be a considerable increase in screening in the future. This possible increase will depend to considerable extent upon the care given the screening already installed. The enthusiasm evinced by the occupants of the houses on the completion of the screening would lead one to believe that for the most part proper care will be taken. The simplicity of construction, as well as the strength and durability of the doors, made a considerable impression upon many of the planters. In several instances plans were under way for more or less complete screening of certain plantations using our type of door, the planters stating that they had been sold to the screening.

Each door hung had a small sticker or poster attached calling attention to the manner in which malaria is transmitted and showing how the house occupant might help to stop the spread. This small poster aroused considerable interest.

The simplicity of the construction of the doors, as well as the method of hanging, makes it possible for a plantation owner to construct them with more or less unskilled labor and to screen the houses at low cost. A hammer, saw, screw-driver and tack hammer are all required in the way of tools. Twenty-four feet of one by six inch boards, a few wooden wedges, and a small piece of metal plate to clinch nails against would be all that would be required to make a frame arrangement and wire stretcher. If material is bought at retail and labor costs are not included, the average tenant house could be screened for a cost of $8.00 to $10.00.

Mr. H. A. Johnson, U. S. P. H. S., Memphis, Tenn. In this discussion I shall confine myself to the screen work as carried out in the overflowed sections of the West Tennessee Counties and particularly to that part of the work which represent a departure from the routine established by Dr. Coogle, and which we have all more or less followed.

It was very late in July when the program for screening same 450 homes in the West Tennessee area was finally approved and in view of the necessity of pushing the work to a conclusion before the relatively short period of summer in that locality should come to an end the State Health Officer of Tennessee temporarily placed extra men with each of the County

Health Units involved to select the houses, take the measurements and direct the application of the screens when they were delivered. The arrangement left me with the main duty of developing the shop at Dyersburg, Tennessee.

The shop was operated under the direction of the manual training instructor of the Dyersburg School and twelve of his students and in the course of operation covering a period of two weeks during which 1440 doors were made the following changes in methods were made as compared with the operating schedule of Dr. Coogle's factory.

(1) After experimenting for some time it was found that all frame members of the doors including the two cross rails could be sawed prior to assembly provided the cross rails were sawed ⅛ inch shorter than the theoretically figured. This saved considerable time and still gave excellent fits for the cross rails.

(2) In the production program attention must be given to lessening the physical labor involved in the various operations, and it occurred to the shop foreman that the laborious use of 6 foot cabinet maker's clamps for holding the door joints together while applying the wire screen could be avoided, and a similar result obtained by inserting a ½x5 corrugated nail (a nail made of sheet metal ½ inch long and containing five corrugations) across each corner joint prior to the application of the wire screen. Cabinet makers clamps were not used at all in the Dyersburg shop, the corrugated nails inserted on the first table after reversing and rewedging the partly assembled door holding perfectly.

(3) The use of wedges driven between the screen clamp and the door to move the door away from the clamp and thereby stretch the wire screen was somewhat slow and not altogether satisfactory, and the shop foreman devised a much faster method of doing the same thing. This consisted of four wooden fingers projecting through and working in slots in the table top between the clamp and door end and hinged below, these fingers being actuated by a foot pedal working in a notched rack at the table end. The stretching operation thereafter, took but a step on the pedal and was very quickly done.

(4) In addition to the padding on the screen clamp we studded the upper holding edge with fine wire brads to give a positive grip. This feature worked to perfection and did not injure the wire screen in any visible manner.

In view of the short time the Dyersburg shop operated that is 14 days and also in view of the fact that some of the above changes were not installed until the work was well under way, it is unfair to attempt to show an increased production due to these changes. However, in a test where the only incentive to the boys was that they were told the shop would close for the day after 125 doors were made we found that number finished at 2 P. M. by twelve boys. I am confident that a daily average of 175 doors could be maintained by twelve boys or fourteen and half doors per boy per day, if working on door assembly alone.

The problems we encountered in transporting and applying the screen doors and window materials are essentially those found in the other projects and I will not burden you with these.

The reaction to screening by the tenants, practically all of whom are white, is promising. Many of the tenants started to paper over with newespaper and paste the cracks and other openings left and many others have been induced to start this work. Approximately 15 per cent of the homes screened have been rendered mosquito proof.

The Health Officer of Lake County laments that he can not claim as many screened houses as he figured on in his County because he says: "Five families moved out of the county carrying the screen doors with them." This is rather a new phase of public health work. I have not yet heard of a tenant's carrying his sanitary toilet with him when he moved to another location.

The work this past summer was in the nature of an emergency, much of the material and supplies were bought at emergency prices and when screen work is comtemplated in the future emergency prices will not in all probability exist. At present the manufacture of this door requires special equipment, the materials of which the door is made are too costly, and the method of assembly is not suitable for the small farmer who may want to screen only a few homes.

I believe that woods much cheaper than cypress can be found, which will be satisfactory. There is evidence tending to show that 24 gauge sheet metal is heavier than necessary for strength and possibly 26 or even 28 gauge might serve as well. With these lighter gauges the extra operation of punching nail holes could be avoided, and possibly smaller nails used doing away with clinching and permitting handling with a magnetic hammer.

These possibilities should be investigated. A type of door can be produced that is cheap in price, effective in service, and that a farmer can cut, lay down on the floor and assemble for his own or tenant houses with practically no outlay for equipment.

Mr. J. A. LePrince, U. S. P. H. S., Memphis, Tenn.— When the U. S. Public Health Service was requested by the Red Cross to assist in giving protection against malaria transmission to the farming population of the flood area, the question to decide was how to obtain maximum results at lowest cost in a very short period of time, and how to plan the work so that it would have a future as well as a temporary value.

It was realized that the project would be subject to delays beyond our control; that we should have to deal with undetermined factors and unknown quantities. We asked for only such limited funds as we could spend to sanitary advantage, and we returned some of the funds allotted. One of the questions we had to answer in May was, how many doors and windows were there on the thousands of farm tenant homes than deluged by the flood that it was proposed to screen? How much would it cost and how long would it take to have the houses screened? Which of the flood covered homes would be occupied by families containing malaria cases or carriers? Where were we to obtain transportation to do this work in thirty-seven counties of four states, and to what extent would the lack of transportation delay the work and increase the costs? The problem was to do a year's work in ninety days without knowing the conditions we were to work under, nor the difficulties that were waiting to interfere with our progress.

In each of the four states where screening of homes has been accomplished the director of the work was given all the responsibilities that go with such an emergency task, and it was left to him individually to determine the solution of such difficult problems as were continually cropping up. We had a fixed date

for the completion of the work and everything was of secondary consideration, except cost and speed.

During the limited period of field operations, varying from 42 days in one state to 120 days in another, more than 6700 homes of malaria cases in the flood area were screened. And if we had been permitted to sell screen doors to all who tried to buy them at the temporary screen door plants, this number would have increased considerably.

At the four screen door plants more than 21,000 screen doors were made and shipped out and we all learned much that we did not know before about screen door construction. What will interest you most is, that while everything else may go up, the cost of screening farm tenant homes of malaria carriers is going to go decidedly down, and that there has been developed by the flood a decided upward tendency for screening of farm tenant homes. One negro mammy even claimed that the highest power of all would surely bring the world to an end "cause white folks is screening colored pussons' homes."

Of course we all realize that although more than thirteen million dollars worth of wire screen is made by the manufacturers annually, yet in malarious districts the families that screening would help most are the very ones that have least of it. It will be of big sanitary adavantage to the entire rural public of malarious districts to have the homes of the families having malaria cases kept effectively screened, and all honor to the few pioneer county health officers that are now busy creating this condition.

The outlook appears so rosy that some of you may decide there is a catch in it, and you are correct. The speed of progress will depend entirely upon the care given to the screen by the farm tenants. Dr. Coogle, County Health Officer of Leflore County, Mississippi, has proven that even with constantly changing colored farm tenants a county health officer can induce those tenants to take better care of the screening on their homes than is given to the screen on homes of the average white family.

The old objection is that a large number of malaria carrier homes are too loosely built to screen effectively. In answer to that it can be stated that within the last ninety days in two counties of Tennessee 15 per cent of the tenants whose homes were screened voluntarily covered up the wall cracks through which mosquitoes could enter. Also, the County Health Officer of Pulaski County, Arkansas, who is really interested in the health status of his county induced 65 per cent of tenants of poorly built homes to paper the walls where mosquitoes can enter.

We are not satisfied yet with the type of screen door we are making. It is stronger, cheaper, and will last longer than any other type yet made, but we believe if its cost is materially reduced more homes of malaria carriers will be screened, and screen door manufacturers will be induced to enter the field with a more substantial door at a lower first cost, and a lower annual cost.

In making the doors for the flood area homes, speed of construction was an important factor. This factor can be omitted under normal conditions. We may be able to construct a new and even stronger door at less cost, without using clinching nails and without using a framing table. A door that can be framed on a barn floor or porch floor at a lower cost than we are now making them, and which will last longer in actual use is our objective and we shall probably have it within a year from now.

One enterprising county health officer had screen doors made at the county agricultural fair to show farmers how to do it. Another was not even satisfied with such a continuous demonstration at a state agricultural fair, but is arranging to screen the homes of all farm tenant malaria case families of his county. The work is now being done and he already has screen doors made for 112 houses. One of our prominent state health officers is planning to screen all malaria carrier homes of an entire county.

What is going to be the result of all this activity?

As the sales of screen have advanced in recent years, the malaria prevalence has lowered itself.

There is a strong tendency today for manufacturing plants to get away from large centers of congested population, and as malaria prevalence is lowered, labor turnover is likewise decreased and labor efficiency increased, so the day may not be far distant when we can and shall look back at the Mississippi River and be thankful for the flood it brought us and the substantial benefits that followed the flood period. Whether or not this condition of malaria elimination will come rapidly depends altogether upon the effort the full time county health officers put into this quick and economic means of banishing malaria.

Dr. W. J. Sandidge, Shreveport, La.—Our inspector assisted Mr. J. A. LePrince and Mr. A. H. Fletcher to screen about 650 tenant houses for the American Red Cross in the Monroe area. We then visited about twenty-five prominent planters of Caddo Parish asking them to pay for screening a few houses on their plantations as a demonstration. Of this number twenty-one agreed to have the work done. We used Mr. Fletcher's figures and Dr. Coogles bulletin on screening in explaining just how the work would be done. They didn't believe it could be done so cheaply, but we succeeded in convincing them. We had our own truck so could transport materials to their plantations and let them furnish some labor to help with our inspector in screening houses. Thus the net cost to the planters would be only for the materials and tenant labor, a total of about $10.00. As a matter of fact, we shall come below the $10.00 cost, because the tenant labor is furnished by the planters free.

Screening the carriers will be our first objective. However we wish to go further. Several planters have already said they wanted more screening done.

During the seven days of the Louisiana State Fair we had for a demonstration the building of these screen doors. Our labor cost was nothing as we secured the help of the boys from the Manual Training Department of the Shreveport Colored High School.

Dr. Felix J. Underwood, Jackson, Miss.—It is largely because Dr. Coogle was willing to pay attention to the little things that he was able to make a success of this work.

Dr. A. T. McCormack, Louisville, Ky.—We have made investigations in two localities in Kentucky where we had an epidemic of poliomyelitis, evidently fly-borne. In properly screened houses there was not a single case of poliomyelitis, while in the unscreened houses there were 61 children who were infected in a distinctly fly-borne epidemic. All the cases occurred in unscreened houses.

Dr. Coogle (closing).—In 1924, when the subject of screening was discussed by Dr. Fricks and Mr. LePrince, a series of 20 houses was selected and screened

by me in LeFlore County, Mississippi. When my report of the costs and results of the screening of these 20 houses was read by Dr. Fricks, it was so different from the opinion of many Mississippi planters who had previously expressed themselves as thinking it was not feasible to screen poorly constructed tenant houses, that Dr. Fricks insisted that the experiment be repeated during the year 1925. Twenty additional tenant houses were screened during that season with similar results and with a lower cost in construction.

By that time, Dr. Fricks felt that the calculations made by Mr. LePrince and me as to cost of screening poorly constructed and dilapidated tenant houses was within economical reach of property owners, and gave sufficient protection to the tenants to justify its use as an anti-malaria measure. In 1926, he decided that he would have me screen a plantation of 64 houses, which I did. The results of this experiment were very similar to the two previous ones. When this recent emergency arose, Dr. Williams and Mr. LePrince were in a position to offer a practical anti-malaria measure by the use of screens, and also to give the approximate costs.

It is indeed gratifying to me to have proven by Mr. Tarbett, Mr. Fletcher and Mr. Johnson in their work in Arkansas, Louisiana, and Tennessee, respectively, that the calculations that we made on the small group were so accurate and feasible that they were applicable whether we be screening 20 tenant houses or 6,000 tenant houses, and whether we be making 50 screen doors, or 20,000 screen doors.

It is convincing that screening tenant houses is a practical and common sense thing for people to do, and it can be done in Arkansas, Louisiana, and Tennessee, as well as in Mississippi, with practically the same effectiveness and costs.

There are two matters I should like to take up, which I did not take up in the paper. Screening, of course, is placing a barrier in order to reduce the number of mosquitoes that may get into the house, and thereby to reduce the number of mosquito bites that the inhabitants may be subjected to.

There is another route by which mosquitoes enter houses, and that is by way of the chimneys. This is a proven fact, and for a long time it was thought that the proper method of closing this entrance was to screen the tops of the chimneys. If screening the tops of the chimneys is properly done, it will prohibit the entrance of mosquitoes, but when it was found that it was more expensive to screen a chimney than to build a screen door for a house, thought was given to other means of coping with the chimney problem, and from experiments conducted by me in LeFlore County, it was found that naphtha, a mosquito repellent, could be hung in the chimney. This proved to be more practical than to screen the top of the chimney. It does not block the chimney nor prohibit the use of the fire-place during the summer months.

This device is a small wire screen basket 2¾ inches in diameter and 12 inches high, with a 1 inch core through the center to allow for ventilation. The baskets can be made for less than 10 cents each. Naphtha with which to fill them costs about 10 or 12 cents a pound. Therefore, these baskets can be made and filled for less than the price of wire screen the size necessary to cover the top of a chimney.

In constructing this device, ordinary wire screen 16 mesh is used for the body, the bottom and the ventilating column, although any perforated material may be used. To form the body a substantially rectangular piece of wire screen 12x9 inches is rolled into cylindrical form. One longitudinal edge of this rectangular piece of wire mesh is bent inwardly upon itself, and the opposite longitudinal edge is bent outwardly upon itself to form flanges which interlock and when clinched serve to hold securely the body in cylindrical form. The ventilating column is formed by clinching in the same manner as the body, a strip of wire screen 12 by 3 inches.

A circular piece of wire screen slightly larger in diameter than the diameter of the body is cut to form the bottom. Onto this bottom is affixed the ventilating column by interlining or interlacing the lower ends of the vertical strands of wire of the ventilating column with the mesh of the bottom. This bottom with the ventilating column attached is then affixed to the edge of the walls of the body by intertwining or interlacing the vertical strands of wire of the body into and with the mesh of the bottom.

When this bottom is affixed the ventilating column will lie positioned within the body in a substantially vertical position and extend from the bottom, to which it is attached, upwardly approximately the whole height of the body and into the cone top, forming an annular chamber around the ventilating column.

Into this annular chamber is placed 1 pound of naphtha balls, a substance disagreeable to the mosquito. An imperforate conical top, the lower edge of which is of substantially the same diameter as the diameter of the body is fitted into the open top end of the body. This conical top is held into place by crimping the upper edge of the body. A wire is affixed to the top of the conical top for suspending the basket of naphtha balls three feet from the top of the chimney. This allows a free passage of smoke through the chimney in case the occupants of the house desire to have a fire during the summer months. In most cases where there are grates or fire-places, the occupants build fires in them on rainy days and "ironing" days.

The other matter I should like to mention is the "LePrince patch" for patching holes that may be punched in the screens by children or careless adults. This patch is made by cutting a square piece of wire screen, pulling the threads for about ½ inch from the four edges. With an ordinary hinge to act as a vice, these four edges are bent at right angles in the same direction and a patch is placed over the hole in the window or door, and the ends of the wire are bent, holding the patch in its proper position. It makes a very neat and effective patch, and can be done by any child of ordinary intelligence. In addition to closing the opening in the screen, it creates an interest in caring for screens, thus reducing the maintenance problem.

MALARIA IN PALESTINE*

By PAUL S. CARLEY, M.D.,†
Belzoni, Miss.

From May, 1922, until June, 1925, I was assigned to the Government of Palestine to assist

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Field Director International Health Division, Rockefeller Foundation.

in malaria survey and control operations. Of the observations recorded in this paper, some are personal and many were made by my colleagues, both in Government service or attached to the Government by outside agencies.

Some knowledge of the geography and topography of Palestine is necessary before a clear picture of the malaria situation there, can be drawn. Palestine and Syria, north of it, form the northern end of the Arabian Peninsula. Two mountain ranges, the Lebanon and Anti-Lebanon, running parallel to the Mediterranean, with a deep valley between them and a flat and almost unbroken plain lying seaward of the eastern or Lebanon Range, shut off this corner of the Arabian Plateau from the rest of the peninsula. The proximity of the Mediterranean Sea and the topographical interruption by the mountain ranges make this corner of the Arabian Plateau the most fertile and least arid of all Arabia.

Modern Palestine is a small country: its greatest length is about 135 miles and its maximum width 65 miles. It is bounded on the west by the Mediterranean Sea, on the north by an empirical line, on the east, with minor exceptions by the Jordan River and on the south by a line through the Negeb or South Desert.

It is further divided naturally, into three distinct geographical sections: The Coastal Plain, the Mountains of Judea and the Jordan Valley. The most westerly division, the Coastal Plain, is a flat sandy, or sandy loam area lying along the sea coast at an elevation not exceeding 300 feet above sea level. The mountains of Judea (the Lebanon Range) jut out to the sea at Mt. Carmel, and break an otherwise continuous strip of flat land across the entire western side of the country, varying from 5-25 miles in width.

The mountains, or central range, likewise parallel the sea, and run the length of the country except for one break in their continuity at the plain of Esdralon. They rise gradually to a height of 3000-3500 feet above the Mediterranean. The central range has a maximum width of 25 miles, and is flanked by foothills in the west and by the Jordan Valley on the east.

The third geographical division of the country is the Jordan Valley, a north and south rift in the earth's crust, dropped from the highlands on either side. This valley is the division between the Lebanon and Anti-Lebanon Ranges. From Mt. Hermon at the north to the south end of the Dead Sea, through Lake Hule and the sea of Galilee, its length is not over 150 miles. The Jordan River, a small and rapidly flowing stream, cuts the valley below Lake Hule in two almost even parts, except where it flares to form the sea of Galilee. From the south end of Lake Hule to the southern limits of modern Palestine the valley lies entirely below Mediterranean Sea level, and the lowest part, the Dead Sea surface, is 1292 feet below the Mediterranean.

Watershed.—Almost all of Palestine drains toward the sea, and only a small part drains eastward, toward the Jordan.

Climate.—The outstanding feature of the climate is its defined rainy season, from November until the last of March. The rainfall varies in the different geographical divisions, from 32 inches annually on the Coastal Plain to 6-18 inches in the Jordan Valley.

Watercourses.—Along the Coastal Plain, spaced at almost equal intervals are twelve small streams. These rise, with few exceptions in mountains and foothills and run in a westerly to northwesterly direction to the sea. They are alike in that their current, except during heavy rains, is slow, their mouths are blocked or partially blocked at the sea, by sand, and they dry up in their upper reaches in summer, leaving pools along their courses. Near the sea they form marshes, sometimes of considerable extent. In the mountains are no large streams. The Jordan River receives, below Lake Hule, only two important tributaries, the Jalud River and the Wadi Farah, but there are other short watercourses which empty into it.

Water Table.—In the Coastal Plain the water table lies near the surface and shallow wells are numerous. In the hills, except for an occasional spring, there is no fresh water, except that stored in cisterns. In the Jordan Valley the water table lies deeper than in the Coastal Plain, and water is obtained from deep wells or springs on the hillsides above the valley.

The population in 1925 was 700,000, not including about 100,000 Nomads. There is no definitely rural population except the Nomads. The fixed population live in cities, towns and villages. The chief industry is farming.

Malaria.—The introduction of malaria into Palestine is obscured in antiquity. There are no references in either the Bible or Talmud which can be definitely construed as referring to it. There is some evidence that in the last century before Christ, the Roman soldiery in Egypt suffered from the disease. It is at least a tenable hypothesis that malaria entered Palestine via the Roman troops in the century before the

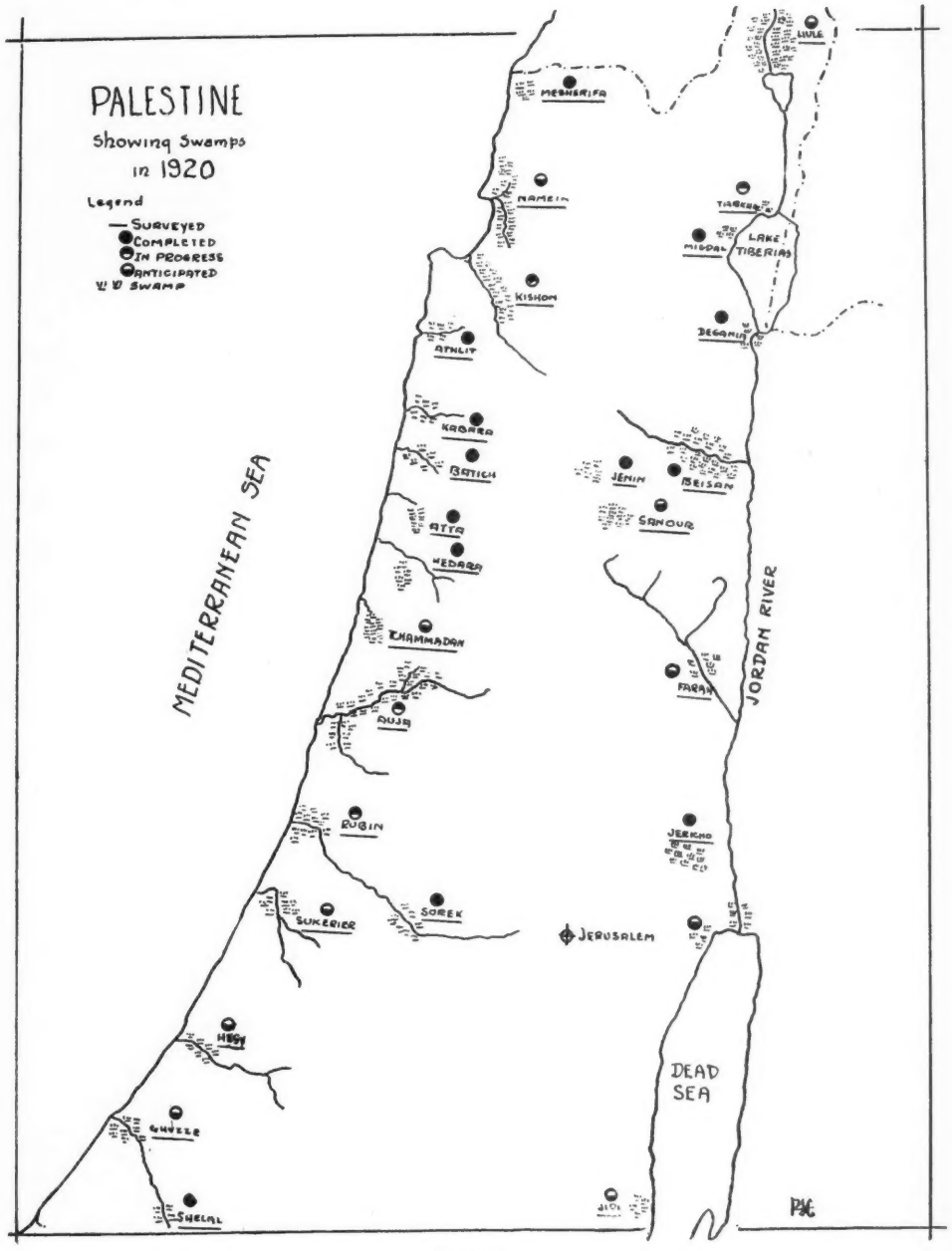
PALESTINE
Showing Swamps
in 1920
Legend
— Surveyed
Completed
In Progress
Anticipated
W W Swamp
MEDITERRANEAN SEA
JORDAN RIVER
DEAD SEA
LAKE TIBERIAS
MEDJERIFA
NAMEIN
KISHON
ATHLIT
KABARA
BATICH
ATTA
KEDARA
KHAMMADAN
AUJA
RUBIN
SUKERIER
SOREK
HEBY
GUVEZE
SHELAL
TIBERIAS
MIDDAL
DEGANIA
JENIN
BEISAN
SANOUR
FARAH
JERICHO
JERUSALEM
LUZE

Chart 1

birth of Christ.* In 732 A. D., Heraclius, in defending Beisan, in the north Palestine, cut the canal system around the town, to impede the progress of the newly conceived forces of Islam, and swamped the surrounding territory. It is possible that this date marks the beginning of malaria in the North Jordan Valley.† Certainly the Crusaders suffered from the disease and in 1799 Napoleon's troops at the siege of Acre, on the sea coast, were ravaged by it.

Except for the work of Mühlens, Yofe and a few others we have no definite records of malaria until the British occupation of Palestine in 1917. Mühlens showed that about 23 per cent of the residents of Jerusalem had parasites in their blood in 1913. Toward the latter part of the Great War the Turkish Army suffered severely with malaria, as evidenced by prisoners of war.[1]

G. Stuart[2] reviewed the statistics for 1922-24 and shows that of 90,872 blood films examined, 13,711 or 15 per cent were positive for malaria. Further, in separating the positive films he found 69.2 per cent benign tertian, 29.3 per cent subtertian and 1.5 per cent quartan. He also showed that benign tertian was most prevalent during June, July and August, subtertian was most common during October, November and December. No conclusions were drawn on the occurrence of quartan malaria.

Anopheles.—Buxton,[3] preceded by Barraud and Lowe, and with some assistance by the writer and Mr. J. J. Mieldazis worked out, in 1922 and 1923, the anopheline fauna of Palestine.

Nine species of anopheles have been reported in Palestine, and of these, six were commonly found and four were important. The other three were rare and, from our standpoint, negligible.

The most important vector was *A. bifurcatus,* a cistern and well breeder. Mühlens recorded it as the only species found in Jerusalem in 1913.

A. elutus (*maculipennis var. elutus, Edw.*) was a widespread marsh and swamp breeder, confined almost entirely to the lowlands.

A. superpictus and *A. sergenti,* similarly lowland species, were fairly widespread and bred in water in which there was some motion.

A. hyrcanus (*sinensis var. pseudopictus, Grassi*) and *A. algeriensis* were marsh breeders and definitely rural in their habits, did not enter houses and were unimportant as vectors. Of the other three, *A. multicolor* was a salt water breeder, found in some parts of the lower Jordan Valley and along the seacoast, and of little importance. The remaining two, *A. pharoensis,* though very common in Egypt, was very rare in Palestine, and a single specimen only of the remaining one, *A. mauritianus,* was taken by Barraud.

Surveys and Control.—From the establishment of Civil Administration in 1919, the Government activities in malaria may be summed up as follows:

(1) Preliminary surveys of sources of malaria by officers of the Department of Health.

(2) The formation of an anti-malaria advisory committee.

(3) Entomological survey, already mentioned by Buxton.

(4) The promulgation of an anti-malaria ordinance, for enforcement of control measures.

(5) Organization of cities and towns for control of breeding mosquitoes.

(6) A village organization for oiling and other anti-mosquito measures.

(7) The addition of two units, to assist the Government in anti-malarial work: first,

A Malaria Survey Section, consisting of a physician (the writer) a sanitary engineer, and for part of the period the Government entomologist, in May 1922; and second, the Malaria Research Unit, consisting of a director, an assistant, a sanitary engineer and a laboratory director together with a corps of assistants (inspectors and oilers in October, 1922). The Survey Section assisted the Government in delimiting the malaria problems among the non-Jewish population, where the Research Unit dealt with the Jewish population and nearby Arabs.

In the period 1922-25, the two units surveyed most of Palestine, examined villagers and nomads for blood infestation, and splenomegaly, proposed control measures, and assisted in carrying these out. In certain areas detailed schemes were drawn up, in others general recommendations were made.

Early after the establishment of the civil administration it was realized that malaria was

*Jones, in the Archives of the Liverpool University, 1921, has given a very scholarly summary of the various references, concerning fevers in the Roman Empire, under the heading, "Dea Febris."

†Dr. Clarence Fisher, of the University of Pennsylvania, was conducting field operations in archaeological research in Beisan during the summer of 1922. On numerous occasions he discussed with me, the absence of any record of fevers that might be attributed to malaria, up to the time of the Islamic Invasion. He was rather firm in his opinion that Beisan was malaria-free until the demolition of the irrigation system, noted above.

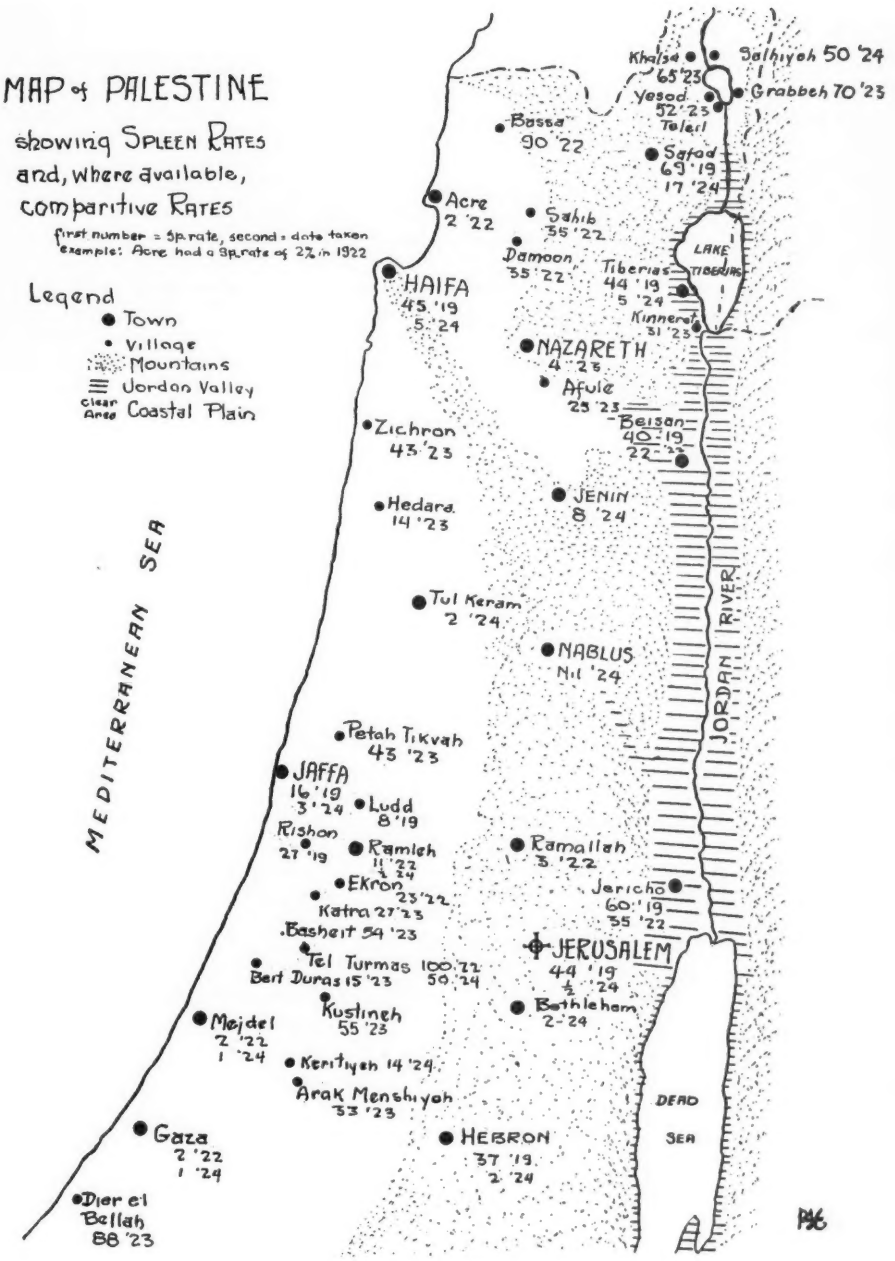
MAP of PALESTINE
showing SPLEEN RATES
and, where available,
comparitive RATES
first number = Sp. rate, second = date taken
example: Acre had a Sp. rate of 2% in 1922
Legend
Town
Village
Mountains
Jordan Valley
Coastal Plain
MEDITERRANEAN SEA
JORDAN RIVER
LAKE TIBERIAS
DEAD SEA
Khalsa 65 '23
Salhiyeh 50 '24
Yesod 52 '23
Grabbeh 70 '23
Telel
Bassa 90 '22
Safad 69 '19 17 '24
Acre 2 '22
Sahib 35 '22
Damoon 35 '22
Tiberias 44 '19 5 '24
HAIFA 45 '19 5 '24
Kinneret 31 '23
NAZARETH 4 '23
Afule 23 '23
Beisan 40 '19 22 '23
Zichron 43 '23
Hedara 14 '23
JENIN 8 '24
Tul Keram 2 '24
NABLUS Nil '24
Petah Tikvah 43 '23
JAFFA 16 '19 3 '24
Ludd 8 '19
Rishon 27 '19
Ramleh 11 '22 3 '24
Ramallah 3 '22
Ekron 23 '22
Katra 27 '23
Jericho 60 '19 35 '22
Basheit 54 '23
Tel Turmas 100 '22 50 '24
Bet Duras 15 '23
JERUSALEM 44 '19 ½ '24
Kustineh 55 '23
Bethlehem 2 '24
Mejdel 2 '22 1 '24
Kerithyeh 14 '24
Arak Menshiyeh 33 '23
Gaza 2 '22 1 '24
HEBRON 37 '19 2 '24
Dier el Bellah 88 '23
P46

Chart 2

widespread throughout most of the country. It was equally realized that in the mountainous section the great potential sources of production of mosquitoes were the village and town cisterns. As has been pointed out before, the only source of water in this area was stored rain water. As it was known that *A. bifurcatus* bred in cisterns and that *A. bifurcatus* was the only anopheles present, vigorous measures were instituted for the eradication of this mosquito. The result was one of the classical examples of anti-larval operations in malaria control. A corps was organized to oil cisterns and wells and assist the property owners in installing mosquito proof cisterns and wells. The larger towns had a gang of men working full time in the town. The smaller towns and villages were served by a traveling inspector who visited each village once every two weeks. Some idea of the size of the task may be gained when, in Jerusalem Town, there were over 5000 cisterns to be oiled every fortnight. In 1924, for the entire country, there were 49,600 potential breeding places on record, and a total of 1,090,911 inspections were made. 516,686 "oilings" were carried out in this year.[4] The results are well illustrated in the case of Jerusalem town, where Mühlens reported a 23 per cent blood infestation in 1913 and the spleen rate among school children was 44.5 per cent in 1919 and where, in 1924, the blood rate was 0 and the spleen rate 0.5 per cent. Another example is Hebron, where the spleen rate was 37 per cent in 1919 and 2 per cent in 1924. This work was well organized in 1922 when the two units just mentioned were added.

The control of bifurcatus breeding did not, however, solve the entire problem, for the malaria on the Coastal Plain, the plain of Esdralon and the Jordan Valley, presented an entirely different aspect, interwoven with the study of *A. elutus, A. superpictus* and *A. sergenti.* Reference to *Chart 2* gives some idea of the extent of marsh land in the country. Cantor[5] estimated the area of land which had been surveyed by the Government and the two Malaria Units, and on which work had been carried out, or was anticipated, at 70,027 acres. Unfortunately, the rich land in the country lies in or near these marshes.

The questions involved in dealing with these areas were first, a determination of the role played by these swamps in the malaria problems nearby; and, second, whether or not a feasible economic plan might be drawn up to deal with the situation. As a general rule all the water in the country was needed for irrigation, as irrigation is very necessary in Palestine for successful farming. At the outset it was realized that the dominant characteristic of any drainage scheme must be the conservation of water so that the irrigated land area might be increased, but by an intelligent application of the principles of irrigation to minimize or eradicate anopheline breeding.

With that point in view and the town anti-larval work on *A. bifurcatus* well organized, practically all the swamp lands in the country were studied by the two units. Some preliminary work had been done previously by the officers of the Department of Health in certain swampy areas. Five large swamps in the north of Palestine were studied, Beisan, Kishon, Namein, Sanour and Hule in the first year and a half. At Beisan some drainage work had already been done. The area was mapped, the population examined and a further scheme consisting of drainage and irrigation regulation, was drawn up. Following the Beisan work, reconnaissance surveys were made at Haifa, on the Kishon Swamp; at Acre, on the Namein Swamp; at Hule on the swamps near the lake and at Sanour. In 1923, in the spring, the Coastal Plain towns in the south of Palestine were studied. It was determined that, in this area, the malaria problem was not of sufficient importance to necessitate any measures further than the routine *A. bifurcatus* control, already in force.

Next the anti-malarial work in Haifa town was reorganized and the Kishon Swamp mapped and a drainage scheme worked out. Jericho Town and surrounding country were next studied and here a simple scheme of irrigation regulation was drawn up. The Hule Basin claimed attention next and this area was studied rather completely and a large engineering scheme was suggested as the only means of control feasible there. Later the swamp at Wadi Rubin and the north coast of the Dead Sea were examined and control measures outlined in these places.

Control Measures.—As rapidly as they were drawn up, special control schemes were presented the Anti-Malaria Advisory Committee in Jerusalem. This Committee, appointed by the High Commissioner was composed of representative men of each of the three religions of the country and certain members from the Department of Health. This Committee discussed the control projects and was helpful in getting appropriations locally in places where the schemes were to be carried out. The details of the control schemes that were gotten up are too voluminous to review here. They varied in size and

detail, but the general plan was the same. In cases where the expenditure of Government funds seemed justifiable, Government money was used. In general the policy of the Department of Health in the control of the disease, was toward anti-larval work. Under existing conditions the measures suggested in and near the swamp areas narrowed down to drainage and irrigation regulations. The important schemes which have thus far been carried out or are in the process of being carried out are:

(1) Beisan. Drainage by Government and local funds of a swamp of 3200 acres west of the town. Following this work the blood infestation rate dropped from 12.5 in 1922 to 1.7 in 1924.

(2) Jericho. Reorganization of the irrigation system, at a cost of $2000 so as to prevent mosquito breeding in irrigated gardens. This scheme saved sufficient water for irrigation of 100 extra acres, paid for by Government funds.

(3) Wade Rubin. At the present time work is under way for drainage of a 1250 acre swamp along the course of this river. This scheme is being financed by the Supreme Moslem Council.

(4) Numerous drainage and irrigation works are done in Jewish colonies on funds of the Malaria Research Unit.

In addition plans are on hand at the Department of Health in Jerusalem for,

(1) Hule Basin reclamation, a large scheme involving the drainage of Lake Hule, the reclamation of its bed, and the reorganization of an immense irrigation system in an area of over 100 square miles.

(2) Kishon Marsh reclamation, a scheme involving the reclamation of about twenty square miles of land near Haifa.

(3) Namin River area.

(4) Smaller operations.

These are to be carried out as rapidly as possible. The total sums spent on Anti-Malaria work in 1924 averaged 20 cents per capita for 700,000 population.

Results.—Swellergrebel[6] in summing up the results as seen in a tour of investigation by the League of Nations Malaria Commission in 1925 brought out the following points:

(1) Malaria in the two or three years previous had been less prevalent and less severe than in the past. The decline (especially in towns) is due to meaures taken against the disease.

(2) Much of the success was due to the enlistment of assistance from the people of the country and the development of a general public health service.

No accurate comparison of the present conditions with regard to malaria and those of the pre-war period can be made. A map showing the decrease in spleen rates throughout the country from 1919-1925 is shown (page 751). Certainly the efficacy of anti-larval measures is strikingly shown in some of the mountain towns, and in Beisan and Haifa in the lowlands.

When the remaining larger schemes have been put into effect, the continuous effort along standard lines of control in force for a greater period of time, and when the general betterment of the population attendant on other practical public health measures, now being worked out in the country, has had an opportunity to become more evident, it is reasonable to believe that malaria may become, at some not too distant time, a very minor public health problem in Palestine.

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2. Stuart, G.
3. Buxton, P. A.: Personal communications, and numerous contributions to Jour. Econ. Ent., and other periodicals during 1922-25.
4. Briercliffe, R.
5. Cantor, L.

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6. Swellengrebel, Prof. N. Reports on a Tour of Investigation in Palestine in 1925, League of Nations Health Organization, C. H./Ma:aria/52.
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DISCUSSION—(*Abstract*)

Dr. T. H. D. Griffitts, Biloxi, Miss.—Dr. Carley said that *A. bifurcatus*, breeding in artificial containers, was responsible for a great deal of malaria, but I do not believe he mentioned the mosquito that was responsible for malaria in the coastal plain, in the salt marsh areas. Will he enlighten us on this point?

Mr. J. A. LePrince, Sanitary Engineer, U.S.P.H.S., Memphis, Tenn.—With regard to the containers and mosquito breeding in the containers, did they have any difficulties in the use of fish as a means of control?

Dr. Carley (closing).—Gambusia affinis is not found in Asia Minor, but there is an indigenous fish, a species of cyprinadon similar in size to gambusia, that is widely distributed in the natural waters of Palestine, feeds at all levels, and will, under certain circumstances completely control mosquito breeding. We used it with success in open agricultural wells and some cisterns. The word "cistern" refers in Palestine to a much larger structure than we associate with the term here. There a cistern is built to hold relatively enormous quantities of water, is ordinarily almost completely closed and is so constructed that little if any sunlight enters it. Cyprinadon will not live under the ordinary conditions obtaining in such a structure. Its use was limited to

the few cisterns that were more open, and to agricultural wells and ponds with clean edges.

I stated that *A. elutus*, a species of anopheles very similar to the California *A. maculipennis*, together with *A. superpictus* and *A. sergenti*, were responsible for malaria on the plains. *A. bifurcatus* played some part, especially in urban malaria but the definitely rural malaria was transmitted, in most cases, by one or more of these three. *A. multicolor*, the local salt water breeder, bred in water in which the salt concentration was as high as 5 per cent. It was a weak mosquito, relatively speaking, was limited in its breeding area to the seacoast and some parts of the lower Jordan Valley and so far as we were able to determine played no part in the transmission of the disease.

AIRPLANES AND PARIS GREEN IN CONTROL OF ANOPHELES PRODUCTION*

By S. S. Cook, M.D.†
Quantico, Va.,
and
L. L. Williams, Jr., M.D.,‡
Richmond, Va.

Six years ago Barber and Hayne[1] devised, successfully tested, and advocated the use of Paris green as an anopheles larvicide. Since then, this dust has been used in the control of the production of anopheles in anti-malaria campaigns throughout the world. The economy of Paris green rests upon two factors, first, its high toxicity; and second, its ease of application.

If carefully applied in high dilution, as done by hand, as little as a quarter of a pound[2] of Paris green may be sufficient to control the production of anopheles within an acre of breeding surface. Such extreme care in application is not economical from a labor point of view, and so, for practical purposes, from one half to one pound are usually applied per acre. For this purpose the dust is usually mixed with some inert dust in the proportion of 1 per cent Paris green to total dust.

Advantage is taken of the wind in distributing this larvicide. Dust is released on the windward side of the breeding ground and the clouds float gently over the area to be treated, depositing small quantities of Paris green for a long distance. Distribution has been by hand, by dust gun, and by airplane. The present paper has to deal with the latter method of distribution.

In a former communication,[3] the authors have gone into the history of this method of application and described the general technic of distribution, giving their experiences in actual control work by means of airplane at Quantico, Virginia, during the summer of 1926. Briefly summarized, the conclusions were, that where production from large areas was to be controlled, airplane distribution of Paris green was easy, effective, and economical.

In the season just passed, control work at Quantico was continued and further experiments were carried out along four general lines, namely, dilution of the dust, quantity of Paris green per acre, number of applications per season, and ability to treat areas covered by dense vegetation.

As can be seen from the following charts, the control of production of *Anopheles quadrimaculatus* was entirely successful at Quantico this year. At every favorable roosting place near Quantico Bay and near Chopawamsic Bay the number of adults was relatively small at all times during the season. At no time were adult anopheles prevalent in the camp. At similar places near Aquia Bay where no control measures were practiced, the numbers soon became large and remained so until cool weather set in.

Chart 1 shows adult *Anopheles quadrimaculatus* at Aquia and Chopawamsic Bays.

Chart 2 shows adult *Anopheles quadrimaculatus* at Aquia and Quantico Bays.

DILUTION OF DUST

In considering the proper dilution of the dust, it must be remembered that although 1 per cent of Paris green in inert dust is entirely successful for hand or dust gun application, that this is too great a dilution to deliver from an airplane 100 to 150 feet above the surface. We have heard of one attempt to control anopheles production by using a 1 per cent Paris green mixture[4] from airplane, where practically no killing resulted. The method was discredited in that area. As we showed last year, 14 per cent Paris green is too great a dilution to be successful under all conditions with airplane distribution.

During the past season, we used 25, 28, 33, and 50 per cent (by weight) Paris green in powdered soapstone. The lower percentages were

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*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Lieutenant Commander, Medical Corps, U. S. Navy.

‡Surgeon, U. S. Public Health Service.

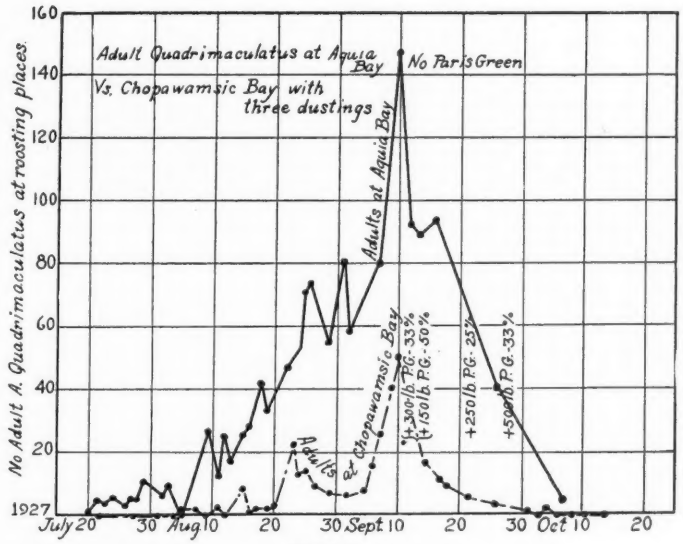


Chart 1.

tried with very low wind velocities, and were entirely successful. In calm weather, 50 per cent Paris green is too great. Two experiences demonstrated this. These were test flights at the lower end of Aquia Bay. On the first the plane flew about 50 feet above the surface of the water, the day being practically calm. After the flight, most of the Paris green could be seen as a heavy, green path approximately 150 yards wide. A few days later, the same experiment was repeated near the same place under apparently identical weather conditions. The plane was flown at a very much higher altitude in order to increase the length of time required for the dust to reach the water, thus securing a wide distribution of the concentrated dust. On this flight the plane flew approximately 400 feet above the surface. Although there was a dead calm at the surface of the water, there was evidently a fair breeze at the altitude of the plane, because the dust was caught long before reaching the water and blown entirely away from the breeding area and disappeared in the wooded hills to the north of the Bay. On the whole, 33 per cent Paris green in soapstone was found to be the most nearly satisfactory dilution for all conditions. This dilution is sufficiently great to give excellent distribution in an almost dead calm by flying 150 to 200 feet above the surface. The same dilution gave equally good distribution in 10 and 12 mile breezes by flying 25 to 40 feet above the surface of the water.

AMOUNT PER ACRE

During 1926 we had concluded[3] that one pound of Paris green per acre was the basic practical unit. We have had no cause to change this opinion. Three times during the season we reduced this amount, and each time found it essential to redust either all or portions of the area of the Bay. On August 11, with about 200 acres of active breeding in Quantico Bay, we

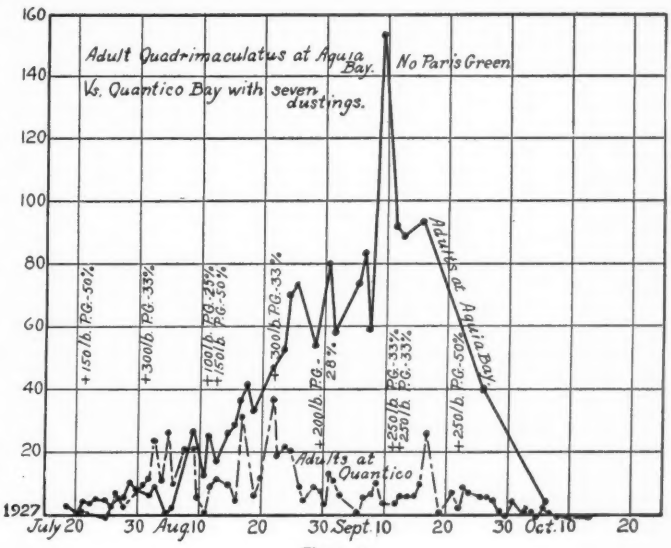


Chart 2.

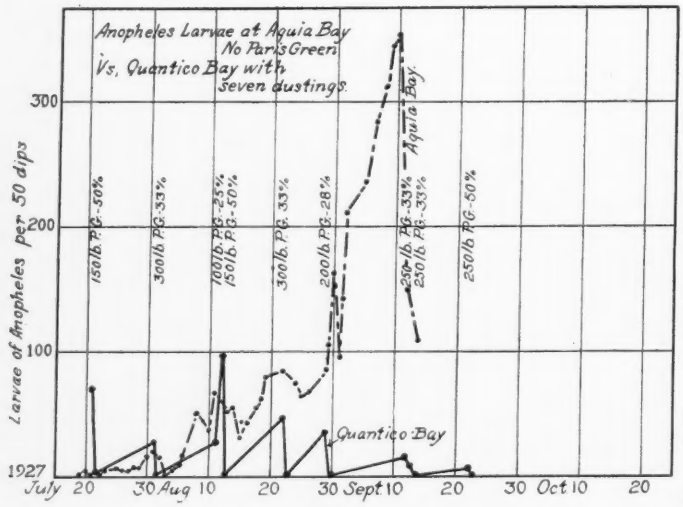


Chart 3.

used only 100 pounds of Paris green in 25 per cent dilution. Larvae were approximately 25 in 50 dips on that day, and the next day considerable portions showed as many as 100 larvae in 50 dips. An additional 150 pounds of Paris green was distributed in 50 per cent dilution, which was entirely successful in killing all the larvae remaining in the Bay. On September 12, Quantico Bay showed 17 larvae in 50 dips, and was dusted with 250 pounds of 33 per cent Paris green mixture. There were approximately 300 acres of breeding surface. The next day, only a slight reduction in larvae was found over a considerable portion of the area, whereupon another 250 pounds of 33 per cent mixture were applied. A few hours later larvae had disappeared entirely from the whole area. At the time of this experiment, a similar experiment was tried in Chopawamsic Bay. Before dusting, 32 larvae were taken in 50 dips, over a breeding area of approximately 500 acres. Three hundred pounds of Paris green in 33 per cent dilution was applied, and three days later certain sections showed a marked increase in larvae, 100 being taken in 50 dips. It was necessary to re-dust these areas with 150 pounds of Paris green in 50 per cent dilution. This was successful in reducing the number of larvae to zero.

Chart 3 gives the effect of Paris green on larvae in Chopawamsic Bay. Larvae in untreated Aquia Bay for comparison.

Chart 4 gives the effect of Paris green on larvae in Quantico Bay.

Observations of breeding at Aquia Creek (near Quantico, Virginia) were made throughout the season in order that certain points might be determined by direct experimental work. Unfortunately, the breeding was very spotty over this Bay until August 23, when, for a brief period, larvae were found in high concentration throughout the entire area. Before floatage was destroyed by a heavy storm, we had opportunity to make but one experimental flight, which revealed information as to the amount per acre and the width of the path which could be expected on a calm day.

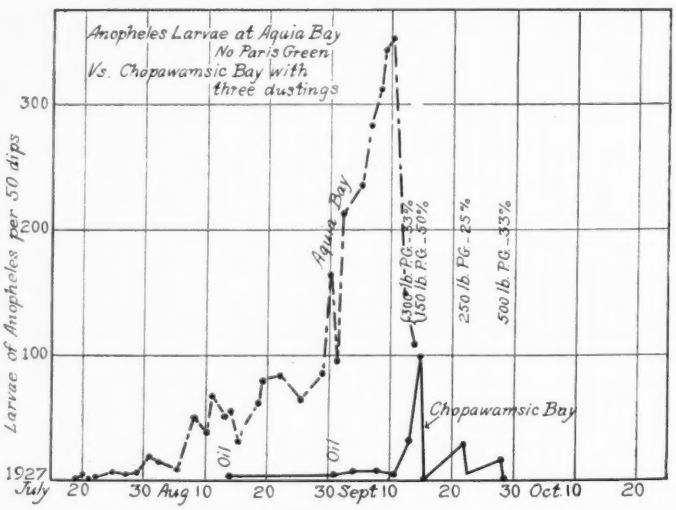
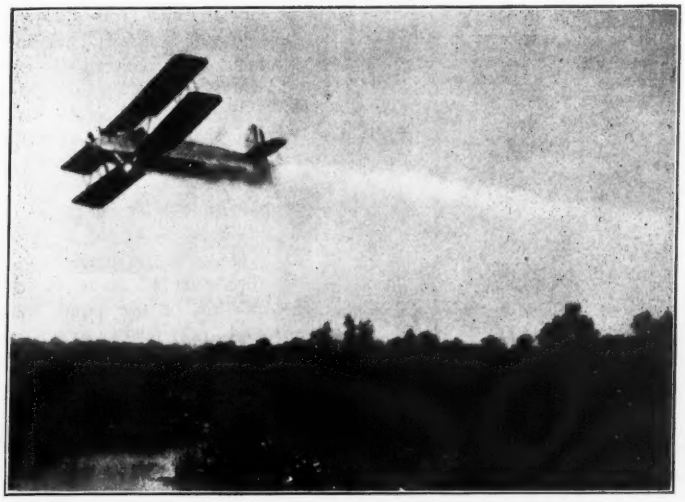


Chart 4.



TW-3 Dusting over moderate vegetation.

Prior to this flight, the inspectors dipped across the breeding ground, finding larvae regularly at least one per dip. The plane flew at right angles to the line of dipping, (about 50 feet above the water's surface), delivering 150 pounds of Paris green in a 50 per cent mixture with soapstone. Four hours after the flight, dippings were made again at the same place. Absence of live larvae and presence of a number of dead ones were found for a distance of 220 yards. The plane continued its flight until all of the Paris green was gone, traveling a distance of approximately two miles before delivering the last of the dust. A lethal path 220 yards wide and 2 miles long is almost exactly 160 acres. This checks very closely with last year's estimate of one pound of Paris green to the acre.

NUMBER OF DUSTINGS PER SEASON

Whereas the summer of 1926 required four applications of Paris green to control production in Chopawamsic Bay, during the past season only three applications were found essential. This was due to the fact that breeding commenced in 1926 about the middle of July; this year it did not commence until about the middle of August. However, during August very small areas in the Bay did breed so heavily that it was necessary either to apply Paris green or go out in a boat and oil. As the areas were small, they were oiled from a boat instead of being dusted.

The breeding, instead of being late in Quantico Bay, as was expected this year, was almost two weeks earlier. Very careful dippings were made frequently in order that we need not apply dust until the last possible day on which it seemed dusting would be effective. This was done in an effort to increase the interval between applications. In spite of this, Quantico Bay required seven dustings during the summer of 1927, the same number it had required during the summer of 1926. Although weather conditions and breeding conditions had varied greatly at these two bays during these two seasons, the number of dust applications and the time intervals were practically the same during the two years.

The difference in cost per acre between the two seasons was less than 3 per cent; the amounts of larvicide used varied less than 5 per cent; the number of dustings varied not at all.

TIME INTERVALS—QUANTICO BAY

1926	1927
12 days	10 days
13 days	9 days
5 days	11 days
7 days	6 days
8 days	13 days
7 days	9 days

These are certainly comparable intervals. The average interval each year was eight days. In spite of widely varying weather conditions, the same number of dustings were required each year, indicating that either seven migratory flights occurred each year from outside areas or that there were seven broods per season. Effective control of an isolated breeding area may require an even less number of larvicide applications.

DUST PENETRATION THROUGH VEGETATION

The question has been raised as to whether Paris green penetrates dense vegetation and reaches the surface of the water in lethal doses. As was pointed out in a former communication,[3] when applied from a plane flying over Chopawamsic Swamp the dust did penetrate excessively dense vegetation with entire success. On one occasion this was done successfully immediately

Typical eel-grass mat (vallisneria spelralis) in Quantico Bay.

after a shower of rain, when the vegetation was wet. We have been told[5] that there are places covered by heavy vegetation where Paris green and road dust has been applied without success. The attempts in these places were abandoned for the reason that the dust did not penetrate the vegetation.

On July 10, an experiment was carried out for the purpose of again testing the penetration of the dust through dense vegetation. A portion of upper Chopawamsic Swamp was chosen, where very dense vegetation was found. A narrow path was cut in the swamp to facilitate getting in and out, and pans of larvae with glass slides nearby were set out at 25 foot intervals, each pan being set 10 to 20 feet away from the path and always under the heaviest growth. Three of the pans were under dense low growth which was under alders, the whole being overshadowed by birch. One pan, after being placed, was covered with low bushes which had been cut at a distance. One pan was set beneath a wild grape arbor which was overshadowed by birch, and which itself covered closely-growing weeds about three feet in height. The plane delivered approximately one pound of Paris green per acre, and four hours later the mortality in each pan was practically 100 per cent. The slides nearby showed Paris green particles varying from 28 per square inch to 69 per square inch. In addition, much of the vegetation was examined by hand lens and but little Paris green could be found on the leaves. The lens revealed much more Paris green on the water itself than on any portion of the vegetation examined.

In order to demonstrate this method of control in uncleared impounded areas, a Navy plane dusted an entirely uncleared pond of 500 acres eleven miles from Bamberg, South Carolina. This flight has been described elsewhere.[6] The results were as follows: before the flight, *Anopheles quadrimaculatus* larvae averaged five per dip; two hours after the flight, a very few first- and second-stage larvae could be found. The following morning, 703 dips over 12 acres of that portion of the pond which had previously shown the heaviest breeding revealed exactly two live larvae and ninety-four dead ones. In this case, one pound to the acre was distributed.

EQUIPMENT USED IN 1927

The plane designated for use this year is known as an NB-2. It has a low landing speed, is easily maneuvered, and has proved to be very satisfactory for air dusting work. This plane carried an average load of dust of about 300 pounds, and generally flew at approximately 60 miles per hour.

Lieutenant F. G. Cowie was again detailed to equip the plane with the necessary dusting apparatus. He prepared a simple hopper of 20 gauge brass, 30 inches high, 25 inches wide, and 30 inches long. From top to bottom this was V-shaped in cross section. He placed the hopper in the after cockpit with a cable outlet-control going forward to the pilot's seat. The filler hole was 7 1/2 inches inside diameter, constructed with a self-locking rubber gasket top. The outlet measured 7 1/2 inches by 9 1/2 inches, and was fitted with a sliding door held shut by means of stop bolts. The cable control, carried to the forward cockpit, terminated in a handle which was easily reached by the pilot. This handle was so mounted as to slide on a bar and permitted regulation of the degree of opening. No agitator was necessary within the hopper. The dust fell by gravity to the venturi-tube mounted below the fuselage. The tube this year was much smaller than last, measuring 2 feet 5 inches long by 8 inches square at the mouth, 7½ inches in the center, and 12 inches square in the rear. The outlet of the hopper opened into the constriction of the venturi-tube, the point of greatest air velocity. The dust was blown out of the tube in an even cloud and was well broken up. The material for this apparatus cost $13.85; the

NB-2, showing venturi-tube below fuselage.

labor for 32 hours at $2.50 per hour was $80.00.

For the purpose of distributing Paris green, any plane of any type may be used and a hopper as simple as the one above described can be installed by any good airplane mechanic.

Adequate planes may be purchased as cheaply as $2,500.00. First-class engines are produced for $4,500, and many cheaper grades (perfectly usable) are on the market.

Good engines may be counted upon to give not less than 500 hours in the air — many of them will give more. The following figures, taken from cost of operation at Quantico during 1927 may be of assistance in helping to estimate the cost of this method of control on a commercial basis.

AMOUNT AND COST OF MATERIALS
1927

Paris green, 3150 lbs.	$532.00
Soapstone, 5800 lbs.	29.00
Total cost for material	$561.00
Number of acres of breeding surface	800 acres
Cost of material per acre for season	$0.701
(For 1926 this figure was	0.724)
Cost of hopper installed	$93.85
No. gals. gasoline per hour	20 gals.
No. gals. cylinder oil per hour	1 gal.
No. acres dusted during 1927	5700 acres.
No. hours of dusting flights	15 2/3 hrs.
No. acres dusted per hour	364 acres.

The flights during two seasons at Quantico and the single flight near Bamberg demonstrate the diversity of type of plane that may be used. We operated successively a TW-3; an NB-2; and a Ford Transport. The first two carried only 200 pounds at each flight; the transport carried 500 pounds. Had we used a specially constructed plane capable of carrying 1000 pounds of dust we could have reduced the flying time 50 per cent or more.

In other words, instead of only 364 acres per hour we could have dusted 728 acres per hour or 5,600 acres per day; almost nine square miles. At that rate, a properly equipped plane should handle 50 square miles a week. This is its limit of operation, as dustings at certain seasons are at seven day intervals. However, such a rate could hardly be maintained by a single plane. Four hours a day for five days of each week would be a more practical estimate; a unit of twenty square miles per plane.

SUMMARY AND CONCLUSIONS

(1) Thirty-three per cent Paris green in an inert dust is the most satisfactory mixture under all wind conditions.

(2) One pound of Paris green per acre is the proper unit.

(3) The number of dustings per season must be determined for each breeding area.

(4) Intervals between dustings varied with the seasons. At Quantico, they were from 6 to 13 days.

(5) Paris green soapstone mixtures, when distributed by airplane, penetrate all forms of vegetation indigenous to the Atlantic seaboard.

(6) Practically any type of plane is suitable for distributing Paris green.

(7) A simple box with sloping sides makes a suitable hopper. No agitator is necessary with Paris green.

(8) One plane could handle twenty square miles of breeding surface.

(9) The material costs approximately seventy cents per acre per season.

(10) Our experience indicates that airplane dusting of uncleared areas is commercially feasible.

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DISCUSSION (*Abstract*)

Dr. W. V. King, Bureau of Entomology, Mound, La.— The work reported confirms the satisfactory results obtained by these authors in 1926. Before the work at Quantico was started it happened that I had an opportunity to see the conditions there and to confer with the men in charge regarding the feasibility of the operations. I should like to add one or two points from my own experiences with airplane dusting during the past few years in the swamp country of Louisiana where we have a greater variety of conditions than those at Quantico. As I recall it, practically all of the breeding

area there is about a half mile in width and, with the dust released at an altitude of 50 feet or more, the proportions and quantity of Paris green as worked out by the authors are undoubtedly quite correct for that particular place. Many of our swamp lakes, however, are long and narrow and a much smaller proportion of Paris green is often of decided advantage in the saving of material and much closer flying is frequently necessary to cover the area completely. This is particularly true when the wind is blowing and in practically all of our work more or less wind was encountered. On a bayou of from 50 to 100 feet in width or lakes up to several hundred feet in width the pilot may misjudge the wind enough so that most of the area is missed the first time, and a second or third trip is required to complete the treatment. Under these conditions as well as others that might be mentioned a great deal more wastage occurs with mixtures as strong as 33 or 50 per cent. Furthermore, in breeding areas which are not protected by trees, much less poison is required than one pound per acre. In our dusting operations in 1925 a breeding area approximately five miles long by a quarter of a mile wide was dusted several times during the season and records kept of the amount of material used. One part of the area, consisting of about 240 acres contained no vegetation other than a thick growth of potomogeton which came just to the surface of the water. On one occasion under favorable wind conditions our estimates showed an average of less than two-tenths of a pound of Paris green per acre for this part of the lake with a larval mortality of practically 100 per cent and even with this small quantity part of the area received more dust than was required for effectiveness. The actual amount of Paris green used here was 45 pounds, a saving of 195 pounds at the rate of a pound per acre. To be sure, the results may be more certain with larger quantities but with our longer breeding seasons and the necessity of more frequent applications the expense of materials must be kept as low as possible.

Dr. Cook (closing).—I am sure the cost of material can be reduced by using a greater dilution and also by reducing the rate of discharge of dust. It is also apparent that the poundage per acre will have to be determined for each locality in which the method is applied. For example Dr. King in his work in Louisiana, was able to obtain good results with 1/4 pound of Paris green per acre, whereas we have been forced to use one pound.

Paris green costs us approximately 17 cents per pound and the diluting dust 0.5 cent per pound.

A SUCCESSFUL METHOD OF REARING ANOPHELES LARVAE*

By W. H. W. Komp,†
Greenwood, Miss.

The recent publication of a paper by Boyd,[1] on a method of feeding anopheles larvae, has led me to publish a method I have used over a period of years with success. Dr. Boyd uses yeast as a food, supplying it in shallow pans equipped with siphons for changing the water, and with marble chips to maintain the proper acidity of the water. Recent unpublished work of Dr. M. A. Barber on food organisms in pure cultures has shown definitely that yeast, either living or dormant, is not a very successful medium for the growth of anopheles larvae. It is most probable, therefore, that the yeast in Dr. Boyd's method acts merely as a substratum for a kind of soup of bacteria, fungi, yeasts and other contaminants, upon which the larvae feed. In some few experiments I have made with yeast as a food I got very variable results. Using Fleischmann's yeast in cups, without changing the water, I got prompt and immediate death during hot weather, but was fairly successful although not notably so during the cooler spring and fall weather.

The only advantages claimed for my method are its universal applicability, its ease of operation, in that no apparatus except china cups and lantern-chimneys are required, and the high percentage of successful rearings, even from the egg stage.

It may be thought by some unfamiliar with the difficulties that it is an easy matter to rear anopheles to maturity from the egg, but the literature is full of citations to the contrary. Freeborn[2] states that working with *Anopheles maculipennis* in California, under as nearly natural surroundings as possible, he was able to obtain only 8 to 10 adult mosquitoes from about 200 eggs. Swellengrebel[3] states that he never was able to obtain anywhere near 100 per cent emergencies from a known number of eggs, as the larval mortality was great no matter what the food. He also emphasizes the increased difficulty of rearing the larvae in hot weather, a point I have noted with grief, and can confirm. One thing which may make considerable difference in the mortality statistics is that it is much easier to rear strong healthy imagoes from quarter-grown larvae, but there is a very heavy infant mortality among the newly-hatched larvae, which seem to die no matter what they are fed, or how. Dr. Boyd states that he obtained 100 per cent emergencies in his experiment. I do not know whether this refers to rearings from eggs, or from young larvae.

METHOD

Anopheles larvae are surface feeders almost exclusively, when there is sufficient surface scum to afford them nourishment. In nature this is

*Read before the National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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almost always the case. The success of the method I have used is perhaps partially due to its simulation of natural conditions in this respect. I get a mass of green algae, the common *Spirogyra*, heat it enough to kill it, put the mass into a tall battery-jar, and fill it to the top with tap-water. In twenty-four hours a thin organic scum forms. This is composed of algae, infusoria, and protozoans of various kinds. Portions of this scum are looped off with an "oversize" loop, and placed on the surface of water in ordinary china cups, in which the larvae are placed. Thin scums are used to feed the smaller larvae, while thick scums in large quantity may be placed in the cups with the larger larvae. As pupation occurs, lantern-chimneys having one end closed with mosquito netting are placed over the cups to retain the imagoes as they emerge. The best type of chimney for this purpose has been found to be what is known to the trade as the Dietz "Little Wizard" chimney. This is small enough to fit over the china cups used.

Apparently with this method there is no limit to the number of larvae one may place in a cup, provided sufficient food is given them. As at high temperatures the larvae are very voracious, it is often necessary to feed them two or three times a day if it is desired to obtain imagoes in the shortest possible time. Otherwise one feeding a day, preferably in the morning, is sufficient, and is best done after the emerged adults are removed in the lamp-chimney and killed.

Some may ask why it is still necessary to determine the species of anopheles from imagoes, when it is easy to determine it by using the larval characters discovered by Paul F. Russell.[4] In my experience these characters are reliable, but in the tropics, and in the Southwest, where other species of anopheles occur besides *quadrimaculatus, punctipennis* and *crucians*, the method may be used to determine the species by rearing the larvae to imagoes. In any case, it is necessary to have larvae full-grown to be sure of the Russell characters, and any method which is successful and not too cumbersome is useful. The whole point of the method is that by using clean water, and feeding only so much as the larvae will clean up, contamination of the water is prevented to a large extent, with consequent lessened mortality of the larvae.

Using this method, I have successfully reared from egg to imago in 10 days, and obtained 12 imagoes from 15 eggs in one checked experiment, and 41 imagoes from 65 eggs, in about 15 days. These are merely the results of accurately checked experiments, in which known numbers of eggs were used. The true value of the method cannot be judged by so few examples, but by its success in bringing to maturity larvae in every stage, day after day and season after season.

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LIMITATIONS IN THE USE OF TOP MINNOWS IN ANOPHELES MOSQUITO CONTROL IN CALIFORNIA AND OBSERVATIONS ON ANOPHELINE FLIGHT ACTIVITIES*

By W. B. Herms,†
Berkeley, Cal.

Among the several matters under observation relating to our California anophelines, in the past few years, two points have been of major interest to us, namely: first, the use of top minnows (*Gambusia*) in control, and second, early and late flight activities. A brief account of our observations concerning these matters may not be inappropriate in connection with the 1925 meetings of the National Malaria Committee of which the writer is a member.

Top Minnow Plantings.—A very large percentage of the California anophelines breed along the edges of transient streams particularly in the spring and early summer after the streams have begun to recede leaving pools along their courses. During the winter season of heavy rains these streams are considerably swollen, becoming rushing torrents after every heavy rainstorm, but by late June or early July they present dry beds unless they are utilized as drainage canals for irrigation projects. When the latter occurs these small creek courses alternately become flowing streams and dry beds unless special precautions are taken to keep some irrigation water constantly flowing.

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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The pools left over by the receding streams are usually prolific sources of anopheline mosquitoes and present together with irrigation both in the ditches and in the drainage to creek beds and elsewhere, problems of considerable importance. These conditions are ruinous to the economic use of top minnows. Winter torrents wash the minnows down to the larger streams from which they do not return and the hot summer temperatures rapidly dry up even many of the deeper pools that might otherwise afford a refuge for those that might not have been washed away during the winter.

The situation is well illustrated in our experiences with *Gambusia* in a creek adjacent to the University Farm at Davis, California. Plantings were made in the fall of 1923 in a branch of Putah Creek, which theretofore always furnished a supply of anophelines for the University Farm in spite of oiling which was difficult to accomplish on account of the underbrush, steep banks and other obstacles. The winter of 1923-24 was an exceedingly dry one and in the spring of 1924 the minnows were found to be present in large numbers. By July the creek bed adjacent to the Farm was dry with the exception of a small portion about seventy-five yards long where the effluent from the creamery condensers maintained sufficient water to support thousands of *Gambusia*. The winter of 1924-25 was a normal one and on two occasions the waters of the creek rose to the level of its banks (twenty feet) and in the low water which followed no top minnows could be found even by seining. No minnows had returned by June, oiling having again been resorted to in the interim when during that month several thousand *Gambusia* were again planted.

Profiting by the experience gained during the dry season, arrangements were made with the irrigators to direct sufficient water through the creek at all times to maintain at least a slight stream throughout the summer. The irrigation water was cut off in October and the creek reverted into a series of separate pools, all teaming with fish which did excellent work in mosquito control.

Now should the winter of 1925-26 be a wet one, no doubt all our minnows will again be washed away. Arrangements are being made to over-winter several thousand minnows in a concrete tank for planting at an early date next year in case the present population is washed out as it was last winter by the high water.

Wherever *Gambusia* can be maintained mosquito control is excellent, but this type of control is practical in only a very small percentage of the mosquito breeding locations of California. The tendency has been to plant these top minnows without following up the results, and in some localities at least, an increase in malaria can be traced to an over dependence on the top minnow.

Flight Activities of Anophelines.—There is much to be learned about the general flight activities of our anopheline mosquitoes. Each year there occur rather regularly early and late flights. For the neighborhood of Vina, California, about one hundred miles north of Sacramento the early flights take place within a few days of February 22, irrespective of the preceding temperatures as reported to the writer by Dr. S. B. Freeborn. At Davis, California, and Sacramento, locations about fourteen miles apart, the spring flight began on February 10 as recorded this year.

At Davis where good local control is exercised, no anophelines have been present for two seasons during the months of March to September. However, each year during the latter part of September and persisting during the first half of October large numbers of anophelines appear which bite readily by day as do the spring migrants. It appears that two distinct migrations occur in California, one in the spring and the other at the close of the breeding season. Males evidently do not participate in these flights.

An invasion of hordes of anophelines into localities where control is being exercised creates a situation that is not altogether flattering to the man in charge of anti-mosquito operations, particularly in view of our contentions that anophelines do not fly far from their breeding places, which is true for the active breeding period but for California at least must be modified to exclude the two great annual flights.

These flights are probably dispersal flights and advantageous to the species. What distance they cover, we do not know positively. Although there is always much solicitude concerning malaria infectivity during the flights, this is not justifiable except to a certain degree in the case of the autumn flight. Here again, we have much still to learn, in which matter laboratory investigations are now in progress.

THE ANOPHELES DENSITY INDEX IN MALARIA RESEARCH AND CONTROL WORK*

By W. V. KING,†
Mound, La.

In analyzing or reporting the results of malaria and mosquito investigations it frequently becomes necessary to make use of figures comparing the abundance of anopheles under different conditions. The methods which have been employed by different workers have usually been varied to meet local conditions or special problems and as yet little effort has been made to obtain such records in a more standardized way. It has occurred to me, as it propably has to others, that there would be a number of advantages if more uniformity could be obtained in connection with the work on our Southern anopheles so that different localities and different investigations might be more readily compared.

In our studies in northeast Louisiana we have constantly had occasion to make use of such comparisons, as for example the comparative abundance in different local areas, the variation in abundance during the different months and the different seasons, the relation of abundance to the blood-feeding habits and to malaria incidence and for other purposes.

I believe also that in determining the results of control measures more use could be made of the density index than has been the case in the past.

In malaria control campaigns a great deal of effort has been expended in determining the effect on the malaria rate, and such records are essential since the object is the reduction of malaria. However, as most malaria control work is based upon mosquito control it is evident that for practical purposes the accurate determination of the extent of mosquito reduction is equally essential and gives more immediate information.

An additional point especially as regards uniformity of records is that many valuable data might be added to the malaria statistics now being accumulated under different conditions if we had the correlated facts as to mosquito density under the same conditions. We are familiar with the expression "the effective number" as applied to yellow fever mosquitoes and a similar situation undoubtedly exists in the anopheles-malaria relation, as has been theoretically demonstrated by the mathematical work of Ross[1] and Lotka.[2] In the yellow fever work a more or less systematized method of determining the prevalence of *Aedes aegypti* has been adopted but as yet we have little information as to the density limit which could be safely permitted in malaria control.

Anopheles quadrimaculatus is now generally considered to be the principal transmitter of malaria in the Southern United States. Perhaps the varied conditions under which it occurs in the different localities will make the problem of measuring density on a comparable basis quite difficult. Nevertheless, it may be feasible to do so in many rural communities and the purpose of this article is to discuss some of our own results in this connection with the hope of bringing out an exchange of information among those who have had related problems.

During the several years that the field station of the Bureau of Entomology has been located at Mound, Louisiana, a great many records have been accumulated as to the habits of larval and adult anopheles and their prevalence under varying conditions.

With regard to larval density we have developed a method for comparing abundance in which a number of stations are selected in the various types of breeding places, and at these stations bi-weekly or monthly records are kept showing the width of the water area, the general surface conditions and the average number of larvae collected by dipping in favorable places. From the measured widths we obtain the surface water index for the locality and this in conjunction with the number of larvae per dip provides a method for comparing larval

TABLE 1

COMPARATIVE ANOPHELES DENSITY, 1919 TO 1926

Hecla Plantation, Mound, La.

(Based on the May to September average of under-house collections and counts.)

Year	No. Houses	No. of anopheles per house per day		
		Males	Females	Total
1919	19	20	102	122
1920	25	73	554	627
1921	20	49	375	424
1922	20	55	558	613
1923	9	44	682	726
1924	14	1	24	25
1925	14	2	13	15
1926	14	11	55	66

*Read before National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Entomologist, Bureau of Entomology, U. S. Department of Agriculture.

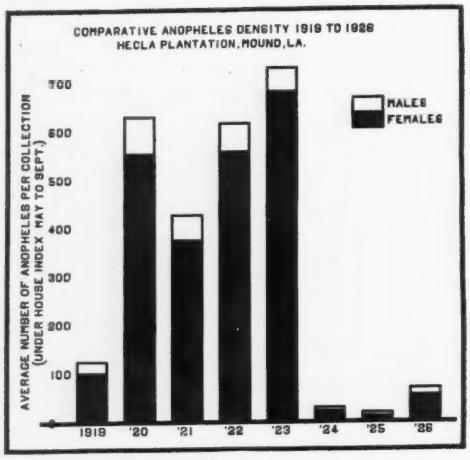

Chart 1.

abundance during the different months of the year and for different years. One of my associates, Mr. G. H. Bradley, has made further studies[3] to determine the output of adult anopheles from unit areas of water as compared to the prevalence of larvae. While this has all given much useful information in our biological investigations it appears to be a less practicable method for comparison of different localities than adult density, although of course local studies of larval distribution are indispensable in any control work.

In the early work at Mound, under Mr. D. L. Van Dine, numerous collections of adult anopheles were made in all types of shelters to determine their daytime habits and from these it was learned that the principal resting places of fed and inactive mosquitoes were inside and underneath the dwelling houses and in stables and other out-buildings. In the woods near the breeding places many adults are to be found in hollow trees during the daytime but the majority of these are newly emerged and still unfed. From the sum total of our observations since then we have concluded that in our locality the great majority of anopheles which come to feed on man or the domestic animals remain in or about the houses and farm buildings the following day. This habit, therefore, provides an opportunity to determine the approximate total number of mosquitoes to which such hosts are exposed.

The territory about Mound is divided up into the typical cotton plantations of the Mississippi alluvial lands, or Delta and cultivation is carried out largely by negro tenants. The tenant dwelling houses are all quite similar in construction, consisting of two, three or four rooms, and are elevated on blocks eighteen inches to three feet or so in height. This elevation of the houses provides one of the favorite resting places for adult mosquitoes, and hundreds or even thousands are often found underneath. The out-buildings vary in number and construction but may consist of a cotton and corn crib and a loosely constructed stable and chicken house. A common building is a combined crib and feed room with a lean-to on each side for the stock and implements. Many of the out-buildings are not highly favorable as mosquito shelters on account of the open construction.

In 1919 a series of houses scattered about over one of the plantations was selected for regular monthly collections of all anopheles about the houses and out-buildings. In analyzing these records at the end of the season it was found that 76 per cent of the mosquitoes collected during the summer months had been taken from under the house. It was also shown from this year's records as well as those of previous years that the density was greatest during the months from May to September, being much reduced usually in April and October and almost negligible in the other months.

In 1920, a second plantation and in 1921 a third were included, the collections, however, being limited to inside and under house collections in 1920 and to under house collections only in 1921.

During 1922, in connection with an investigation of the blood feeding habits of anopheles and their infection under natural conditions[4] complete monthly collections were again made at the entire series of selected houses on the three plantations, the records covering a period of seven months and a total of 46 houses. At the end of this season, with the assistance of the Department of Biometry of the Johns Hopkins School of Hygiene, an analysis was made of the records thus obtained for the four years and some of the salient points of the results may

TABLE 2

ANOPHELES DENSITY IN DIFFERENT LOCATIONS ON THREE PLANTATIONS

Average number of males and females per collection from May to September, 1922.

Location	Hecla	Killarney	Algodon
Inside house	75	31	283
Under house	613	237	1702
Out-buildings	347	115	1103
Total	1035	383	3088
Per cent under house	59%	62%	55%

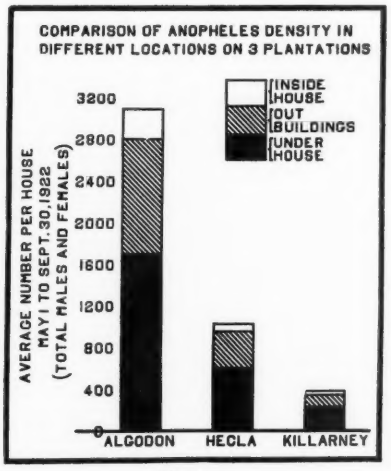

Chart 2.

be briefly pointed out: The inside-house collections were the most variable of any of the different locations and when taken by themselves furnished a poor index of total abundance. The principal resting place was underneath the house and these collections were highly correlated with total abundance; a further high correlation was found to exist in the collections at the same house for different months of the season and for different seasons. From the standpoint of adult habits this last observation is of considerable interest since it may be taken to mean that mosquitoes are attracted to a particular place in more or less the same relative proportions for month after month. This tendency has been further shown in other records which we have and in which daily or weekly counts have been made at adjoining places over a considerable period of time. A peculiarity of the habit is, that of two near-by places which to all outward appearances are quite similar one may consistently have several times as many mosquitoes as the other and this has made it necessary to include more places in the collections than would otherwise be required in order to have a satisfactory average.

Since 1922, in order to maintain a record of seasonal abundance and variation without an undue expenditure of time we have selected under-house counts, made once each month from May to September, inclusive, as our density index. Before adopting the count in place of actual collections its feasibility was determined by counting the mosquitoes under a series of houses previous to making complete collections. This had shown that quite accurate counts could be made by a careful worker after a little practice. A flashlight is necessary for examining the dark corners and with a hand tabulator separate counts of males and females can readily be made. The identification of the different anopheline species is more difficult. *Anopheles punctipennis* and *crucians* normally occur only in very small numbers in our locality but in areas in which they are more numerous it would probably be necessary to make partial collections along with the counts to establish the proportion of each species.

The counted numbers for all houses on one plantation are averaged for the monthly density rate. The monthly rates for the five summer months are then added together and again averaged for the seasonal index, which is expressed as the number of anopheles per house per day. We now have such an index for the Mound area for the eight years from 1919 to 1926 inclusive, the 1927 records having been interrupted by the overflows of the Mississippi river in May and June. In addition, as mentioned previously, we have two entire season's records and many other collections as well showing total abundance in all locations and the proportion of each of our three species.

In regard to the selection and number of places to be included in such records several factors were necessarily considered. Vacant houses were not used by us and those occupied by only one or two persons were avoided when practicable, as were also houses or other buildings having inaccessible shelters. Otherwise, typical places as well scattered as possible were made use of. When for any reason a house could not be used the following year a nearby place as similar as possible was substituted.

The number of houses required to give reliable records depends upon the variation in density and as a rule the smaller the unit of

TABLE 3

ABUNDANCE OF ANOPHELES BY MONTHS ON HECLA PLANTATION FROM APRIL TO OCTOBER, 1922

Month and avg. Date of collections	Average No. per collection from house and outbuildings		
	Males	Females	Total
April 27	1	70	71
June 5	69	830	899
July 11	141	1490	1631
August 8	88	1271	1359
August 26	45	596	641
September 21	23	622	645
October 24	3	11	14
May to Sept. average	73	962	1035

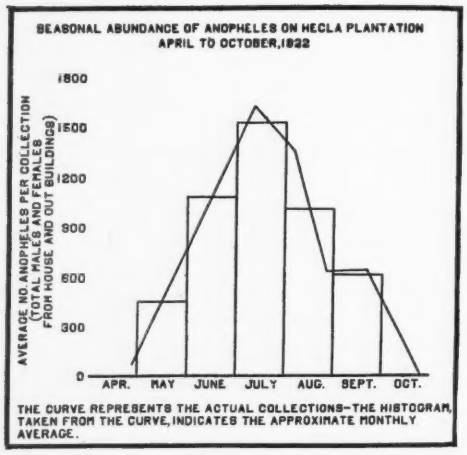

Chart 3.

area the less is the variability. In our work we have made an effort to keep the probable error of the mean as determined by statistical methods within a limit of about 10 per cent of the mean. This limit has not, however, always been maintained, usually due to the fact that a single house might have an excessively large number of mosquitoes and as a result the entire series would show a high degree of variation. In *Table 1* is shown the number of houses included in the averages each year for one of our plantation units. The number of places occupied by tenant families or day laborers varied from about 85 to 95 so that the ratio of houses at which counts or collections were made was more than one out of five during the first four years of the record and more than one out of seven during the last three years when, as a result of droughts, the density was much reduced. In 1923 only nine houses were included but this number was considered to be inadequate.

Herein are given several tables and charts showing certain comparisons which may be made from our density records. The figures appearing in the tables are all from averages, but for present purposes the decimals have been dropped and only whole numbers given.

While comparative abundance has usually been determined by catching or otherwise obtaining the total number of mosquitoes in a given location, mention should be made of another method in which the collecting time is limited to a period of ten minutes or so at each place and relative densities are expressed as the number caught per minute or per man-hour of search. This system would appear to have certain advantages, especially in the saving of time, and has been employed by Smillie[5] in his studies of malaria in Alabama and by Boyd[6] in his work in North Carolina. Our own results with the method in the Delta have not, however, been satisfactory since it was found to be impossible under many conditions to obtain a proportionate part of the mosquitoes from different locations in a limited time. This was especially true where the mosquitoes were fairly numerous and one series of comparative collections may be mentioned in which the relative total density was shown to be nearly twice as much as that indicated by short-period catches.

As a means of saving time in obtaining density records for purely comparative purposes we have found that the counting of mosquitoes about the buildings may be employed to advantage if it is properly checked-up for accuracy, which may consist of a recount of each place by the same or another person until a single count can be relied upon; or, as has been done in some of our work, collections may be made for a time to verify the counts.

If counting is to be employed instead of collecting, locations should be selected in which the resting mosquitoes can readily be seen with the aid of a flashlight. In this connection we have found that counts inside the dwelling houses are not satisfactory because of the many articles of furniture and clothing behind which the mosquitoes may hide. Counts as well as collections are also unsatisfactory in buildings having high rafters or in those of unusually rough construction.

Unfortunately, for the purposes of obtaining comparative statistics, localities differ in the kind of shelters offered for resting anopheles and many places do not have the uniform living conditions found in the Delta under the negro tenant system of farming. However, in concluding this discussion, there are two suggestions which may assist toward the end of securing greater uniformity of density records in the rural communities of the South. The first is that a sufficient number of preliminary collections be made in each locality to determine the principal resting places, the approximate total abundance of anopheles and the proportion in each general type of shelter. When feasible such observations should extend over at least one entire season since a certain amount of variation in the proportions may be expected at different times of the year and with different densities. The

second suggestion is that if one type of shelter is to be selected for the density index it should be one of the principal resting-places and should be reasonably uniform at the various dwellings or stations where counts or collections are to be made.

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DISCUSSION (*Abstract*)

Dr. John A. Ferrell, I.H.B., New York, N. Y.—I should like to ask Dr. King if those records are for the period since the flood waters subsided and what the outlook is for the future. Were your collections on a monthly rate?

Dr. King.—Yes.

Dr. Ferrell.—Is it likely that the anopheline density in this section following the flood is going to rise again to the 1922 or 1923 level? Also are there any indications of an increase in the amount of clinical malaria?

Dr. King (*closing*).—Replying to Dr. Ferrell's questions, our first complete count this year was made in August and at this time the density rate was fairly high but at least no higher than in some of the previous years. By September the numbers had dropped off rapidly.

During the overflow breeding was very much scattered as there was an almost constant current which prevented the accumulation of debris except in occasional protected spots. By the time the water had receded to its normal areas practically all of the smaller aquatic vegetation, including water lilies, grasses, ceratophyllum, duck weed, jussiaea, and algae, which afford protection and food for the larvae, had been washed away or destroyed by the increased depth of the water. It will probably be some time before the aquatic growth will become reestablished to its former condition.

In regard to the malaria situation, we were really expecting something of an epidemic especially in the local camps established for the returning refugees but so far as I have been able to learn there has not been a serious increase. It was suggested by some of the local physicians that this may have been due to the lack of carriers since anopheles and malaria had both been much reduced as a result of the unfavorable mosquito breeding conditions during the past three seasons.

SALT MARSH MOSQUITOES: SOME PHASES OF THE PROBLEM IN SOUTHERN STATES*

By T. H. D. GRIFFITTS, M.D.,†
Biloxi, Miss.

"The control of all species of mosquitoes is sanitary work and should be promoted in every way by sanitary authorities."

These are the words of Dr. L. O. Howard, until quite recently Chief of the Bureau of Entomology, U. S. Department of Agriculture, and the most distinguished entomologist in the world today.

For a long time we have separated mosquitoes into two general classes, disease carriers and non-disease carriers. A more significant division, from a sanitary standpoint, would put mosquitoes into three classes (a) mosquitoes that are directly responsible for the transmission of specific diseases; (b) those that exert a less direct influence on individual and public health, and hazard well-being; and (c) those that are harmless. In the first class in this country are species of anopheles which transmit malaria, and *Aedes aegypti* (*stegomyia*) the transmitter of yellow fever and dengue. When, or if, these diseases are totally banished, then these mosquitoes fall into the second class, those that exert a less direct influence on individual and public health, and hazard well-being.

As to the (b) class, there are multiple species of many genera, that through their bites irritate, pester, torment, worry, depopulate, almost devastate; that decidedly lower physical fitness even to the point of definite, though non-specific, illness. The salt marsh mosquitoes are among the most notorious of this class. The writer knows of instances and localities wherein these mosquitoes not only take the profits from business, such as live-stock and poultry raising, but have actually caused the death of domestic animals. Not only this, but the hordes of salt marsh mosquitoes, at intervals and over rather long periods, have driven labor from the fields and forests, slowed, even stopped, the wheels of industry; emptied hotels and pleasure resorts, and closed public schools. In general they have raised so much disturbance of that kind that only the

*Read in Section on Public Health, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Epidemiologist, U. S. Public Health Service, in charge of Survey of Salt Marsh Areas, South Atlantic and Gulf States.

brevity and force of a Sherman can define, that in the midsummer of 1926, the Congress of the United States appropriated $25,000 for the fiscal year 1927, and an additional $10,000 for 1928, to be expended by the U. S. Public Health Service in cooperation with the Bureau of Entomology of the Department of Agriculture

"for a preliminary survey of the salt marsh areas of the South Atlantic and Gulf states, to determine the exact character of the breeding places of the salt marsh mosquitoes, in order that a definite idea may be formed as to the best methods of controlling the breeding of such mosquitoes."

Then, under class (c) there are several species of mosquitoes which do not bite, while others though blood suckers, breed in small numbers or in such localities as not to constitute a menace. With these only entomologists are concerned.

In the South Atlantic and Gulf states, from Virginia to Texas, both inclusive, there are vast tracts of low-lying lands that are wet and subjected more or less to being covered by tides. These constitute the "salt marshes." In these states there is an aggregate of 5,600,000 acres of salt marshes, in round numbers as follows: Alabama, 34,000, Florida, 680,000; Georgia, 329,000; Louisiana, 3,381,500; Mississippi, 26,500; North Carolina, 427,000; South Carolina, 429,000; Texas, 315,000; Virginia, 206,000. From these figures it will be noted that within the State of Louisiana there is 58 per cent of the total salt marsh acreage of the South Atlantic and Gulf states, and it is of interest to know that in that state is half of the salt marshes of the United States.

To one unfamiliar with problems of this nature, these enormous figures might be sufficient to discourage support of efforts at control. Although there are millions of acres of salt marshes in the South Atlantic and Gulf states, the Public Health Service feels that the task of control is not a hopeless one. In the first place, this survey has brought out the fact that the character of the marshes varies widely, and that only a small proportion of them, generally considered, constitutes actual, or even potential, breeding areas. In many sections vast expanses of marshes are daily covered at high tides. These are not producers of mosquitoes. Consequently, one of the first objectives of the survey was the classification of the marshes according to tidal and other influences which bear a direct relation to salt marsh mosquito production.

With the limited funds, the short time and a coastal zone extending from Norfolk, Virginia, to Brownsville, Texas, over which to extend a preliminary survey "of the exact breeding places of the salt marsh mosquitoes," it was at once recognized that the survey should be conducted along definite lines, namely: selection of (a) certain more or less typical areas in which to conduct intensive studies of the species of mosquitoes, their egg-laying habits, larval development, flight habits and conditions influencing these; character of soils and vegetation; influence of tides and climatological conditions; natural aquatic and aerial enemies; larvicides and other methods of control under varying conditions, and (b) more or less rapid surveys in marsh areas over the whole coastal territory and the collection and compilation of reliable data from all available sources relating to the problems of the different regions. For the studies in detail most of the work has been conducted from the field headquarters of the survey at Biloxi, Mississippi, while other intensive studies have been carried on at points in Florida and North Carolina, and at present at one point in Louisiana.

Time will not permit, in this brief paper, to dwell upon the mass of information already obtained by the preliminary survey. However, it will be in place to take up something of the types of mosquitoes, their habits, some suggestions as to control measures, and the interests concerned in the problems.

The most intolerable pest and nuisance among the salt marsh mosquitoes is *Aedes sollicitans*, generally known as the notorious "New Jersey mosquito." It is the chief representative on the long distance migration flights that have occurred inland from our Southern marshes. Second in importance is *Aedes taeniorhyncus*, although its sustained flight apparently is not nearly so great as that of *sollicitans*. *Culex salinarius* is a poor third in the race. *Anopheles crucians* and *Anopheles atropos* (a spotless winged member of the malaria-carrying genus) are found in great numbers and are vicious biters in many of the marshes. As a salt marsh breeder *Anopheles crucians* occurs generally in the South Atlantic and Gulf states, and, at times, even outnumbers and "out-bites" the non-anophelines present. Aside from being a fresh water species, too, *Anopheles crucians* breeds in various degrees of salinity, sometimes in water of even a higher salinity than the sea water. *Anopheles atropos*, concerning whose life history we knew little prior to this survey, has been found to breed in salt water only, apparently the higher the salinity the better. This is one of the most intrepid biters found in the marshes, and at times near

its breeding grounds occurs in numbers greater than all other species combined. We have not worked out its role as a malaria vector, although it has been found to enter houses freely and bites by day and by night.

The egg-laying habits of the salt marsh aedes play a part in mass production of these species. Unlike anopheles, for instance, aedes lay their eggs on the marsh soil. When there is a drought, the eggs are continuously deposited on the dry marsh even for months. Then the drought is broken by rains, or the marsh is flooded by unusually high tides or these conditions combine. Within an hour eggs begin to hatch and the result may be billions of mosquitoes. Flight may then take place as merely a dispersal, or with prevailing breeze (but not strong wind), and proper temperature and humidity a migration flight may occur, extending in some instances 30 to 40 miles inland.

Various methods of control are being studied and limited areas have been selected for experimental work. There are areas where gravity drainage is both quite effective and economical, while in others diking and pumping is the only feasible plan. On account of the cost of filling, this is only practicable where the demand for such reclaimed land makes the operations profitable. On the other hand, there is great promise in the application of larval poisons from airplane or land machines. The time may not be far distant when a cheap egg-destroyer may be applied and we need not wait for even the larval stage. Again, the chemist may develop a poison gas against the winged insect, that will be nontoxic to man and to other forms of valuable life.

The Congress of the United States has recognized the salt marsh mosquito problem as one of interstate importance in general welfare, and while the apportionment of the appropriation made would be only six and a quarter mills to the acre in the territory of the survey, yet we feel that a very necessary step has been taken, which should eventually lead to satisfactory control of the tormenting salt marsh mosquitoes. State, county and municipal officials, commercial organizations, citizens, individually and as organizations, industrial and health interests are vitally concerned. Further to permit this perfidious pest, parading as an uncrowned monarch, to preempt and rule over some of the choicest sections of the Southland, as is the case today, would be to admit defeat of man's ingenuity, science, and skill, business acumen and political sagacity.

DISCUSSION (*Abstract*)

Mr. J. A. LePrince, Memphis, Tenn.—I believe that the results of the surveys and studies being made by Dr. Griffitts will be of considerable benefit to many communities.

Also the elimination of the sources of the salt marsh pestiferous mosquitoes will result in increasing property values to such an extent as to produce a large annual income to the county and to the state. Recent investigations have also shown that feed grasses for stock can be grown on some parts of what we call the salt marsh meadow lands.

Dr. Griffitts (closing).—I would add nothing at this time except to center your thoughts on the great importance and extent of the salt marsh mosquito problems of the Atlantic and Gulf coasts. If solution were impossible, money expended on surveys would be wasted. Control is possible, and surveys in detail should follow the present preliminary survey, funds for which are provided only to the end of this fiscal year, June 30, 1928.

AUTHOR'S NOTE.—An additional Congressional appropriation of $15,000 was made for the fiscal year 1928 to further extend the survey.

OIL LIBERATOR*

By WILLIAM O. WETMORE, M.D.,†
Schofield Barracks, Territory Hawaii.

It is a well known fact that mosquitoes breed in water. If the water is oiled, the larvae coming to the surface are suffocated.

The device shown herewith is designed to oil waterways economically. This comprises a conical can, with a diaphragm, forming a receiving compartment for sand to sink it, while the upper chamber thus formed is to be filled with a coal oil mixture. The capacity of this chamber in the various cans is one to five gallons, respectively. A tube leads from near the apex to the lowest part of the oil chamber, which acts as a siphon for water, displacing the oil. When the can is tossed in the water, it sinks and bubbles of air escape, followed by droplets of oil, the rapidity being governed by the size of an opening in the top of the can.

The can must be fully filled with sand and water to sink. As the oil droplets burst on the surface, they then spread and are carried in a wide rift over the surface filming it evenly. The best mixture for fresh water is about one part coal oil and four parts fuel oil (Diesel). On brackish water the Deisel oil need not be diluted.

The advantage of this method is the ease with which a great area may be controlled by carry-

*Received for publication December 26, 1927.
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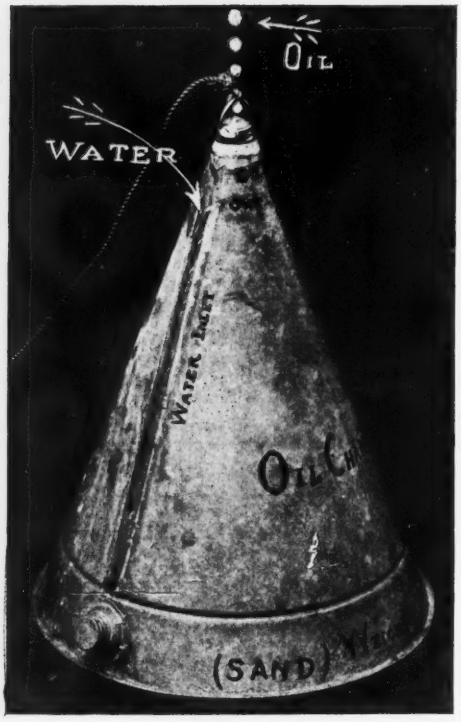

ing a truckload of cans around over a section and tossing them in the pools, where they automatically oil the ponds. This gives the engineer not only quick action but makes it possible for him to know the amount of oil and overhead expense in his estimation of cost. The cans have a cord attached with a cork so that they may be recovered and refilled. Even if this process takes a week, the cans can be back in the ponds in plenty of time to catch the next brood of mosquitoes.

The gallon cans are about a foot high and the five-gallon two feet high. They are made of heavy galvanized iron and by the action of the oil last indefinitely.

Our experiments indicate that a five-gallon can will control an area as large as a city block and keep it oiled if changed three times a month.

One feature of this oiler is that in places where overflow occurs the can will oil as soon as it is submerged and stop when the water subsides.

Attention is invited to the ease and cleanliness of this method in stimulating the lay members of communities independently to rid themselves of the mosquito pests.

One may use a greater quantity of a better oil mixture, and it still costs a fraction of other methods.

MALARIA CONTROL WORK IN ALABAMA: PROGRESS REPORT (1927)*

By S. W. Welch, M.D.†
Montgomery, Ala.

"An ounce of prevention is worth a pound of cure."

The program in connection with the enforcement of the regulations which has been carried out on impounded water projects since 1923 bears out the above maxim. There are few, if any counties in the State of Alabama in which the people are not acquainted with the responsibility assumed by any person who impounds water. The malaria epidemics which followed the impounding of water previous to the passing of the rules and regulations, as exemplified by the Gantt outbreak, have brought anew to the attention of the people the fact that newly impounded water causes sickness.

During the past year in enforcing the preparation and maintenance of impounded projects it has been necessary in only one instance to bring pressure to bear through the Attorney-General's office. In all, seventy-one inspections were made on the projects under permit with the result that (a) seven ponds were caused to be drained and re-cleared; (b) four were found to have had the dam washed out and the projects abandoned in three instances; (c) two projects had not been undertaken although permits had been issued.

Lake Martin, the largest artificial reservoir in the South, comprising forty thousand acres with a shore line of approximately seven hundred miles, was the only project to require added control work and detailed investigations. Owing to the physical condition of the lake at the 147 foot elevation it was found impossible to control the *Anopheles quadrimaculatus* production in a certain restricted area. Mr. C. C. Kiker, a state engineer, spent two weeks on the project working out methods of control and trying out various combinations of kerosene and crude oil, effect of wave wash on exposed shore-lines, and possibilities of control by use of Paris green. Lowering

*Report to National Malaria Committee (Conference on Malaria) meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†State Health Officer.

of the water-level two feet changed the whole situation and the anopheline production was completely controlled. Mr. Kiker also determined in reference to the flight range of Culex that a number of the ten thousand stained specimens were recovered a distance of two miles from the point at which they were liberated.

During the winter months a survey was made of the male school children in Houston and Coffee Counties to ascertain the history and spleen index. Our aim was to determine the practicability of the measure, to be used by all of our county health officers in locating the areas of malaria infection in their counties, if any. The results were as follows:

	1. Houston	2. Coffee
Boys examined	1935	1747
Pos. malaria histories	780	178
Enlarged spleens	372	83
Positive history rate	40.31%	10.19
Positive spleen rate	19.22%	4.76

The survey showed that the distribution was not a general one. In Coffee County there were three areas which surrounded mill ponds which produced *A. quadrimaculatus* in abundance. These ponds are now controlled. The distribution in Houston County is along the southern and eastern borders where the county is flat and effective drainage is beyond any economic possibility. An educational program to encourage screening is to be carried out. The time consumed in making these surveys was not excessive and could be carried out in conjunction with school examinations in all counties.

Summary of Projects under Permit:

Number of impounded water areas	69
Number of counties in which areas are located	24
Number of areas before 1923	5
Number of areas in 1923	8
Number of areas in 1924	8
Number of areas in 1925	20
Number of areas in 1926	18
Number of areas (to date) 1927	15
Total number of acres in areas	88,361

List of Impounded Areas before 1923 and not under Permit:

Mitchell Dam	1921	5500 acres
Gantt Dam	1921	2100 acres
Newton Dam	1922	240 acres
Lock 12	1914	6500 acres
Muscle Shoals	1917	20000 acres

Summary of Malaria Work as Reported by Counties (Organized):

	Beginning of Season	Increase during Season	Decrease during Season	Total at End of Season
Known endemic foci in county	64	5	7	62
No. of these surveyed	49			
No. of foci eliminated				8
No. of foci partially controlled				22
No. of old foci under maintenance				41
Population protected				220,500
Cost of control (labor and material)				$87,513.61

Ditching:

New ditching 39,932 yards	$9,050.96
Old ditching cleared and maintained	193,800
Oiling of Foci	60,000 gals.
Total cost about	$29,000.00

Local Mosquito Measures were carried on in:

1. Birmingham
2. Cloverdale, Montgomery
3. Mobile
4. Selma
5. Demopolis
6. Dothan
7. Foley
8. Fairhope
9. Bay Minette
10. Anniston
11. Jacksonville
12. Piedmont
13. Opelika

MALARIA CONTROL IN ARKANSAS (1927)*

By M. Z. Bair,†
Little Rock, Ark.

We have filed a statistical report, showing that in Arkansas we have had an increase in the number of cities undertaking malaria control work. There are 35 cities, incorporated, that are doing the work, 25 under our direct supervision; that is, the communities are visited regularly during the season and the work checked and those locally in charge advised. Twenty-one of these communities have spent something over $71,000 and we feel our per capita cost is too low for best results.

We have under observation one impounded area which, generally speaking, has been in excellent condition. There is only one point on the area which has produced mosquitoes, and this is not of sanitary significance, due to the fact that there are no habitations in close proximity. Two other impounded areas are up for consideration now and will probably be studied within the next year.

Rural work has not taken on any extensive development in Arkansas. There will probably be a great stimulus to this class of work resulting from the screening which was so excellently done under Mr. LePrince's and Mr. Tarbett's direction, and also as a result of the great increase in full-time county health units which we are experiencing in Arkansas. We feel certain that rural work will soon develop and grow rapidly.

*Report to National Malaria Committee(Conference on Malaria) meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Chief Sanitary Engineer, State Board of Health.

MALARIA CONTROL IN FLORIDA (1927)*

By B. L. Arms, M.D.,†
Jacksonville, Fla.

Very little interest in this subject has been displayed by communities and counties having malaria problems. The main activity along mosquito control lines was in localities having practically no malaria problem. With return of normal conditions to Florida the malaria problem has again resumed its natural habitat, namely, in the area north and west of the Suwannee River and East of the Apalachicola River, a continuation of the limestone sink area in Georgia. Daytona Beach reports that the anti-mosquito campaign there, carried on by the Health Department as a routine procedure have wiped out dengue and malaria fevers. Perry, the county seat of one of the most heavily infected malaria counties in the state, has continued its maintenance work after the anti-malaria drainage program, put over by the State Board of Health and city and lumber interests some years ago. Reports from officials and citizens there are that the work is very valuable. The city of Perry has a compulsory screening ordinance and it is enforced. No other city in the malaria section has shown any great activity. Public interest in malaria has been aroused in many small centers through activity of the Florida Federation of Women's Clubs which has had the problem presented to its members through moving pictures, talks, and reports. The State Chairman of Public Health has adopted "mosquito control" as her program for two years.

The State Board of Health can offer no financial aid to any community doing malaria work. No other agency is offering aid. The only full time county health department under medical direction has been doing excellent educational work along this line.

A comprehensive malaria survey about an impounded area of 15,000 acres was made before clearing was started or water impounded. Smears were taken, adult mosquitoes caught and identified and local breeding places observed. Out of about 800 thin smears only one positive was found and out of 395 thick smears some two months later eighteen positives were found. The histories of malaria of all persons within a mile of the new shore line were taken.

*Report to National Malaria Committee (Conference on Malaria) meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†State Health Officer.

MALARIA CONTROL IN KENTUCKY*

By A. T. McCormack, M.D.,†
Louisville, Ky.

At Herrington Lake, in the Dix River Dam section all of this year there has been almost an entire absence of anopheles breeding. Culex breeding continued. It seems that the vegetation along the edges of the lake have been cleaned out very considerably by the fishermen and the boats. There is no malaria.

Our flood in Kentucky came a long time before there was any particular flood elsewhere, and we did not do much about it in the early stage. In the flooded area we had a very considerable increase in anopheles breeding, and about 100 per cent increase in reported malaria cases. From the interior rivers, the Green River and Cumberland and other water sheds, there was a considerable increase in malaria, because many ponds and sloughs had filled that had been dry during the drought, in several of the counties.

Concerning the flood situation, we did not realize there was as much water in those counties as there was. In the area of the Mississippi itself there has not been so much increase because we used quinin prophylaxis in the beginning. There has been considerable swamp drainage work done, most of it toward the end of the season.

But we have had an increase of 100 per cent in our reported cases. Of course, that is not accurate, but the increase in reported cases is considerable food for thought. In 1923, we had 2,300 reported cases of malaria. They were in the neighborhood of 1800 last year. This year there have already been a few more than 3800 cases reported on the morbidity charts of physicians.

One of the difficulties we had at the time we were starting our screening operations in Hickman County, was a ruling from the Red Cross that the tenants themselves had to make the request through the local committee for the screens. Of course, that meant that we could not screen at all, because these tenants were out in the mud planting cotton and the screening operations were very much delayed there. We succeeded in getting some mosquito bars, and they were of considerable assistance in that par-

*Report to National Malaria Committee (Conference on Malaria) meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†State Health Officer.

ticular area. That is the only county in which we had the least increase in malaria incidence, in the flooded section.

I believe that was a mistaken policy. If the plantation owners could have made the requisition for the screens we should have had the entire area screened. We shall have it screened anyhow, but it will take longer to do it.

MALARIA CONTROL 1927 AND 1928 IN GEORGIA*

By L. M. CLARKSON,†
Atlanta, Ga.

Our malaria control for the current year has consisted in rendering service to municipalities for eradication of both the pestiferous mosquito and the anopheline, especially the anopheline, in sections of high malaria infection.

Engineering surveys and estimates have been made for drainage projects affecting both urban and rural communities. One major drainage project is now under way. This is a dredging project and will require two years for completion. This is a malaria control project of prime importance. Several other such projects are being promoted.

Regulations are being enforced for malaria control measures on hydro-electric impounded areas. There are approximately thirty-five such impounded areas. All of these have either been cleared or are in the process of clearing. On several of these areas oil is being applied during the breeding season and on one throughout the year.

The expansion of control operations since last year is chiefly on problems of impounded water. Clearing of proposed impounded areas and others previously impounded and application of certain oil mixtures and cost data on same are outstanding.

Control of artificial impounded waters by clearing and oiling and elimination of natural impounded waters by drainage are expected to be the outstanding activities for the coming year.

*Report to National Malaria Committee (Conference on Malaria), meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Chief Engineer, State Board of Health.

MALARIA CONTROL OPERATIONS IN MISSISSIPPI (1927)*

By FELIX J. UNDERWOOD, M.D.,†
Jackson, Miss.

The following data in circular form were sent to those concerned during the month of February, and in general, as intended, indicate the conditions existing at the beginning of the year:

To Directors of County Health Units:

It is thought that the following information, pertaining to the general condition in this State, regarding malarial fever, may be of interest to you and serve to aid your plans for 1927.

In 1924, there were 79,631 cases of malarial fever reported for the State. In 1925 the number of cases reported totaled 71,950—a material reduction.

In 1926, 71,871 cases were reported — only 79 less than the preceding year.

For the first time in six years, total cases of malarial fever reported during the third quarter have exceeded the number reported for a like period during the preceding year.

In 1925, of 11,630 blood specimens examined, 14.61 per cent were found to be positive.

In 1926, of 10,491 specimens examined, 14.23 per cent were found to be positive.

In the 14 Delta counties malaria showed an increase of 1.25 per cent in 1926 over 1925.

Of total cases of all diseases reported 33.4 per cent were in the Delta, while 46.2 per cent of the malaria was in that section.

For the State, from June to November inclusive, there was an increase of 3,538 cases of malaria.

As these months represent the principal malaria transmission period of the year it is indicated that the disease actually increased in 1926, and that a large number of infections will be carried over into 1927.

A map showing the density of malaria, by counties, throughout the state in 1926, was recently mailed to you.

In 1925 the departure from normal of rainfall was minus 5.06 inches. In 1926 it was plus 2.05 inches, there being over 7 inches more rainfall in 1926 than in 1925.

There were 11 more rainy days in 1926 than in 1925, and the periods of rainfall were more suitable for continuous anopheline production during the malaria transmission months.

Temperatures were slightly more favorable in 1926 for warm weather activities of mosquitoes which were vastly more numerous than for several years.

If the present weather conditions continue without killing frosts and freezing, an early crop of *Anopheles quadrimaculatus* may be expected. Earlier, more severe and increased malaria may be the result.

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†State Health Officer.

Information similar to the foregoing can be furnished for most of the counties.

Sincerely yours,
George Parker, Director,
Malaria Control.

For the first nine months of 1927 the departure from normal of rainfall was minus 0.34 inches, while there was a deficiency of 3.40 inches for the corresponding period of 1926. There were, therefore, 3.06 inches more rainfall for the period this year than in 1926.

There were ten more rainy days this year, January through September, than for the same period of 1926. The periods of rainfall were in general equally suitable for continuous anopheline production during the two periods.

Temperatures were more favorable in 1927 than in 1926 from February to August for warm weather activities of mosquitoes.

In April, 1927, the mean monthly temperature was 5 degrees above normal. Unseasonably warm periods occurred near the beginning of the month and about April 28, with heavy frosts in the north and central counties about April 23. Except in the overflowed district, farming operations made fair to good progress, generally.

In April, 1926, the mean monthly temperature was 3 degrees below normal, being deficient at all stations having an established normal. The month was unusually cool with frost on the first. Vegetation, in general, was unseasonably belated, and soil abnormally cold. Considerable cotton and corn planted early in the month failed to germinate promptly and much replanting was necessary. At the close of the month farm work was about two weeks later than the usual average. This condition, in general, maintained until about May 15.

The warning issued, and prediction made in February, is reasonably substantiated by the preceding data for April 1927 and April 1926.

Before entering upon that section of the report giving activities, the following data is presented which indicates the general trend malarial fever has taken throughout the state so far this year, from January 1 to September 30.

There has been an increase in malaria of 18.7 per cent for the entire state.

This increase occurred in 57, or 69.5 per cent, of the 82 counties, and ranged from 0.8 per cent to 128.9 per cent.

In the remaining 25, or 30.5 per cent of the counties, malaria decreased from 1.5 per cent to 41.7 per cent.

Thirteen of the 14 Delta counties show increases ranging from 0.8 to 58.3 per cent, the remaining Delta county showing a decrease of 30.4 per cent. It was completely inundated during the flood.

Of the ten counties in the flooded area, 4 of which were completely inundated, 9 show increases ranging from 0.8 to 58.3 per cent.

The average increase in the 14 Delta counties was 17.3 per cent.

The average increase in the counties in the flooded area was 12.9 per cent.

The average increase in the Delta counties not in the flooded area was 28.4 per cent.

The average increase for the counties not in the Delta was 32.5 per cent.

The average increase for the counties not in the flooded area was 32.2 per cent.

Should malarial fever be compared with typhoid fever, using the 1926 data which is complete on both deaths and cases for both diseases, the following would be noted:

During that year there were 2,613 cases of typhoid with 390 deaths, and 71,871 cases of malaria with 409 deaths.

The deaths from typhoid were 14.9 per cent of the total cases reported, and from malaria 0.6 per cent.

According to acceptable data it is found that in Mississippi, considering deaths only, there were 185,250 days lost from typhoid fever in 1926, and 1,227,000 days lost from malarial fever. An economic loss of but one dollar per day represents a tremendous price paid in one year from either disease, particularly malaria.

Assuming the 2,000,000 population are housed in 400,000 buildings, sanitary excreta disposed will cost at least $4,000,000.00 in laying a permanent foundation for typhoid control.

In 1926, Mississippi had 78 counties with a malaria rate in excess of 10 per 1000. If $5,000.00 were available and intelligently expended annually as an average for each of these counties, in ten years $3,900,000.00 would have been expended, and the state would be practically free of malaria.

These figures are relative, and results depend on organization. While the figure quoted for malaria control can be reduced fully 50 per cent, the relation is given to indicate what the result might be if malaria control were to be given the consideration and made as intensively a part of health programs as is typhoid control. This is thought to be worthy of the consideration of the National Malaria Committee.

During the season special malaria and mosquito control campaigns, receiving supervisory aid from the central office, were conducted in municipalities having a total population of 80,000.

About the beginning of the malarial season, April 21, the Mississippi River levee broke in Bolivar County resulting in the complete flooding of four counties and partial flooding of six counties, all being located in the heaviest malarial section of the State.

During the entire season activities of malaria personnel at the central office were almost completely confined to this section of the State.

Aid from the Red Cross made possible the distribution of thousands of mosquito bars, quinin, and oil in abundance. Further aid from the Red Cross on a screening campaign advised by the U. S. Public Health Service resulted in the screening of windows and doors on 3,276 houses, with 171 houses yet to be finished.

The malaria situation in Mississippi requires a larger organization operating out of the central office. The study of the individual or county problem and the working out of a program, basically the same for all counties in the state is decidedly important, and can be best handled through the central office.

There is not, in the State of Mississippi, any problem in malaria control that can not be effectively dealt with by following a reasonable and low cost program, making the control of this disease a part of the regular program of full-time county health departments in counties having a malaria problem of sanitary importance.

The tendency of the desire of the people of this state is toward general mosquito control, and to be able to follow up such a lead will hasten the control of mosquito-borne diseases.

MALARIA CONTROL IN SOUTH CAROLINA*

By JAMES A. HAYNE, M.D.,†
Columbia, S. C.

In the latter part of 1926, numerous complaints of mosquito prevalence in various towns caused the inauguration of surveys for community mosquito control. Twenty-five towns were visited in which complete surveys were made, maps prepared and reports submitted to the health authorities outlining specific control measures for each town necessary to eradicate mosquito breeding.

About 25 per cent of the towns adopted the recommendations made and good results were apparent in these towns. The towns not adopting our recommendations are at present requesting help in mosquito control.

A pamphlet was compiled giving complete instructions as to mosquito control for communities and these were distributed very generally throughout the State. This pamphlet embodied complete control measures, a mosquito ordinance and a weed ordinance. The control measures outlined in the pamphlet, with the addition of the ordinances, have proved entirely effective wherever adopted.

Arrangements having been made with Clemson College, the University of South Carolina and the Citadel, lectures were delivered in March to the senior class in engineering at these colleges, emphasizing the relation and importance of engineering work in malaria control. As a result of these lectures, this work will be undertaken each year as requested by the college authorities. In addition to the above lectures, a pamphlet was compiled and mailed to all practicing engineers in the State and those outside the State practicing in this State, requesting their cooperation along the lines indicated in the pamphlet.

The Highway Department was requested to cooperate with the State Board of Health along these lines and their work during the past year has proved satisfactory and efficient, borrow pits having been drained, culvert pipes being correctly located and other control measures, such as oiling, having been carried out in a satisfactory manner.

The definite development of a dam on the Saluda River about ten miles above Columbia impounded a lake of 75 square miles for hydroelectric development. Negotiations were entered into with the Lexington Water Power Company in which they agreed to finance a malaria census survey of the territory adjoining the lake. The International Health Board agreed to cooperate with the State Board of Health in this survey and an exhaustive survey was made during the summer months consisting of a field force in

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†State Health Officer.

charge of Mr. L. T. Coggeshall, of the International Health Board, assisted by two medical students and an engineer, resulting in the examination of 4,365 persons with a complete malaria history of each person recorded. A map was prepared and blood smears taken. It is proposed to continue the investigation in the vicinity of this lake during the next four or five years, requiring the necessary control measures to be taken to prevent an increase in malaria prevalence in this section.

Through the cooperation of the United States Public Health Service, the United States Navy and the citizens of Bamberg, an experiment in aeroplane dusting with Paris green over a densely wooded pond was carried out successfully.

MALARIA CONTROL IN TENNESSEE*

By E. L. Bishop, M.D.,†
Nashville, Tenn.

The malaria control problems in Tennessee lie principally in the western part of the State between the Tennessee and Mississippi Rivers. This is an area some 100 miles wide and 100 miles long.

Five counties in West Tennessee did county malaria control work in 1927. They are Shelby, Obion, Lake, Dyer and Lauderdale. Control in the latter three counties was made more difficult by the flooding of large areas of land by the backwaters from the recent Mississippi River flood.

Surveys were made by the flooded counties, including all of the towns therein, and recommendations made for proper control. The National Red Cross supplied oil, one tank car and 131 barrels for use in the three flooded counties. The distribution of the oil and general malaria control was under the direct supervision of the local full-time county health departments. Intensive quinin prophylaxis was used in these counties.

The National Red Cross provided some $5300 for the screening of homes in the flooded area in Tennessee. A screen door factory under the supervision of the United States Public Health Service was installed at Dyersburg, and 1400 screen doors were made. The doors were made by the local high school class in vocational training. The doors were put up, as well as the screening of the windows, under the supervision of the County Health Units. A total of 956 homes were reported as screened. Eight of these were in Shelby County.

Shelby County started malaria control in 1923 in cooperation with assistance and money from the State Department of Public Health. Shelby County did anopheles control over 130 square miles of territory in 1927. This area was largely around the City of Memphis, but many of the smaller communities out in the County did good work. Fifty thousand gallons of oil were used, all of which was waste oil from filling stations. Twenty-five pounds of Paris green mixed with 100 parts of dust were used for mosquito control in the river bottoms. For culex control, ten barrels of disinfectant were used, one gallon of disinfectant being added to fifty gallons of oil. Private individuals spent about $5000 on ditching and the County did a mile of ditching.

In 1924-25 Shelby County stocked 1500 ponds with *Gambusia affinis*. The ponds were observed in 1927 and the minnows are in large numbers where there are no large fish.

County malaria work in Obion County has been principally along Reelfoot Lake, where educational work and many posters were put up regarding malaria control and the advisability of screening and prophylaxis.

The following cities and towns in Tennessee did mosquito control work this year: Memphis, Covington, Ripley, Halls, Gates, Dyersburg, Union City, Franklin, Tiptonville, Ridgely, Martin, Trenton, Humboldt, Milan, Cookeville, Brownsville, Dresden, Jackson, Cowan, Murfreesboro, and Chattanooga. Many smaller communities also did malaria control work. The Division of Sanitary Engineering made original surveys for control and re-inspections in the majority of the cities.

Impounded water mosquito control problems

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†Commissioner, Department of Public Health, State of Tennessee.

continued to grow in importance in Tennessee in 1927. Falling Water River Dam, owned by the City of Cookeville, had very good mosquito control this year. Control was effected by clearing, oiling and regulating the pond level with flash boards on the crest of the dam.

The Tennessee Electric Power Company about completed the clearing of its reservoir at Rock Island. This reservoir has one hundred and twenty-five miles of shore line. Additional surveys for control will be made next year.

The accompanying table shows that there has been a gradual decrease in the death rate for malaria in the principal counties in West Tennessee, and a more rapid decline in the counties that have health units. This probably is due to the general idea that is being disseminated on malaria control, better information to the practicing physician and to the public, and a very extensive road building campaign, while, on the other hand, in the counties that have full-time county health departments we have been getting better reporting of malaria and in the meantime have been confirming diagnosis by blood smears which in a way will eliminate cases that were once diagnosed as malaria.

MALARIA DEATH RATE BY COUNTIES, 1920-24, INCLUSIVE (FIVE YEARS)

Counties	1921	1922	1923	1924	1925
Shelby	48.	62.9	38.7	36.5	28.5
Gibson	36.6	25.1	27.3	9.1	24.8
Obion	56.4	17.6	42.3	42.3	35.2
Lake	43.8	65.4	23.4	43.3	21.5
Tipton	92.2	75.5	32.7	26.1	45.6
Lauderdale	102.1	83.4	78.6	18.5	36.8
Weakley	28.9	19.3	16.1	12.9	3.2
Dyer	23.1	75.2	55.2	22.6	16.
Haywood	23.6	19.7	11.8	31.5	23.6
Fayette	34.7	25.1	18.2	18.7	21.7

Shelby County death rate (average, 1915 to 1922) 61.3
Shelby County death rate (average, 1922 to 1925) 41.3
Malaria control started 1923.

Gibson County death rate (average, 1915 to 1922) 36.7
Gibson County death rate (average, 1922 to 1925) 21.5
Health Unit started 1922.

Obion County death rate (average, 1915 to 1922) 48.7
Obion County death rate (average, 1922 to 1925) 39.9
Work started 1923.

MALARIA CONTROL ACTIVITIES IN TEXAS: RESUME FOR 1927*

By J. C. ANDERSON, M.D.,†
Austin, Tex.

	Malaria Cases Reported	Deaths reported
1924	16,068	141
1925	11,502	192
1926	13,728	139
1927	8,971	133‡

No. of counties reporting malaria 96
No. of towns carrying on mosquito control work in some way 106

The amount appropriated for control activities by the cities and by the State was a little less than in former years. Several drainage projects were completed by the Reclamation Department which will minimize mosquito propagation to some extent in the areas drained. Minnows were distributed in some of the irrigated districts.

Educational articles were submitted to the press and pamphlets and folders on mosquito control were sent to quite a number of schools. Local inspectors received training on methods of mosquito eradication at our "short school." The Cotton Belt Railway Company continued its anti-mosquito program in a number of towns along its line.

Plans were perfected to have the Missouri Pacific run an educational train over its lines carrying an exhibit car illustrating mosquito control measures. (This train was run in January and February, 1928.)

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†State Health Officer.

‡For ten months.

MALARIA CONTROL ACTIVITIES IN VIRGINIA*

By H. G. GRANT, M.D.,†
Richmond, Va.

In 1927 the malaria activities in Virginia consisted in educational work carried out in nine counties in which there were no organized county health departments, and study and con-

*Report to National Malaria Committee (Conference on Malaria) meeting conjointly with Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Director of Malaria Control, State Board of Health.

trol work conducted by the health officers in most of the organized counties in Tidewater Virginia. The educational work consisted in the distribution of literature on malaria control in the unorganized counties through the school children.

In Accomac County the health officer has made a re-survey of the various ponds and has given special attention to the districts of Chincoteague and Tinney's Pond. These two places have been the only two in which quadrimaculatus breeding was found this year. In Northampton County a re-survey of the county has been carried out. Several additional ponds have been discovered which were breeding quadrimaculatus. The town of Cape Charles has had this year over twenty cases of malaria. The breeding places which were responsible for this malaria have been determined and control measures projected.

The combined unit of Norfolk and Princess Anne Counties, which began this year, is conducting a survey of both counties. In neither one of these counties is malaria a major problem. At the town of Virginia Beach in the county of Princess Anne, control of anopheline breeding by dusting with Paris green has been carried out successfully during the season.

In Nansemond County the studies of previous years have been kept up both at Lake Prince and at Lake Cohoon. At Lake Prince we are still controlling anopheline breeding by cleaning and fluctuation. In Lake Cohoon breeding was this year controlled by the draining of the upper portions of the Lake. Beginning June 27, six feet of water were drained from this Lake; this removed the water from the upper reaches of the Lake and, as a consequence, breeding ceased for the rest of the season. Control has been also carried out in Nansemond County at Pinner's Pond, the overflow of Lake Kilby, the Atlantic Coast Line Pond and at the Kingsboro Pond. In these last two ponds control was effected by dusting with a mixture of Paris green and road dust. This method of control was effective.

In Brunswick and Isle of Wight Counties our malaria program has been interrupted by the changing of health officers. Malaria is no longer a problem in Brunswick County, but in Isle of Wight it constitutes the major problem. Murphy's Mill Pond and Carrollton Pond are to be drained this autumn.

The re-survey of Henrico County has revealed many more ponds than those previously studied. Malaria, however, is not a problem of any great importance in this county, there being a few cases discovered on the outskirts of the City of Richmond.

Southampton County, which was just organized this year, is making a survey for the first year's work. Special attention has been given to the towns of Boykins, Branchville, Franklin and Courtland.

In addition to our malaria work a study of the pest mosquito has been carried out throughout this section this year.

The following year we hope to further our rural malaria work by the organizing of new counties. Urban malaria is no longer a problem in Virginia.

CONTROL OF MALARIA IN THE CITY OF MEMPHIS*

By J. A. LePrince,†
Memphis, Tenn.

Since cotton was first grown in the market area of our City we have been importing malaria cases, and until the present health administration took hold very little had been done to stop malaria transmission within the city limits.

For ten years before malaria prevention activities were undertaken the malaria death rate averaged 80 per 100,000, and in the seven years of anti-malaria activity the average malaria death rate was 20, a reduction of 75 per cent. What is this work costing the average tax payer

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*Clinic, Clinic Session, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

†Senior Sanitary Engineer, U. S. Public Health Service.

today? It costs us about four cents per capita. For a family of nine persons we pay for malaria freedom and mosquito nuisance freedom 36 cents per year, or say the cost of one square yard of screen wire.

Health officers of other cities of the malaria belt can bring about similar changes in their city suburbs if they so desire.

The detail of the field procedure in the mosquito control work in our city was published by the U. S. Public Health Service in the "Proceedings of the Malaria Field Workers of America."

In recent years some of our malaria cases have been what we sanitary engineers call "auto malaria" or "Ford malaria" and it is our impression that there is much less "tin-canitis malaria" than certain verbal malariologists claim. As a matter of fact, only a small percentage of the few anopheles eggs laid in containers develop mature insects, as was shown by the investigations of Van Dyne.

It is always difficult to determine or even to guess how many malaria carriers may be present in any potentially malarious suburb of a city, and so where *Anopheles quadrimaculatus* is or may be present it is advisable to see and know that the kitchen screen door is not held open at dusk while local colored conversations are taking place.

Some of you may not know that when malaria was more common than it is today the section of our country having the highest malaria death rate was in Missouri. I recently visited a river valley in a section of that state that was formerly decidedly malarious, where all the rural homes are now well screened and in a week of intensive search could not find a single case of malaria. *Anopheles quadrimaculatus* is very abundant there yet.

I have followed the progress of malaria control activities in this city since 1916, and know that very good and very low cost control is being achieved. If the public support of the work being accomplished by the sanitarians was a little more intensive it is probable that malaria transmission would soon be history only. It was my good fortune to be associated with Gorgas and Carter for twelve years, and in our yellow fever eradication we found that long before we got the stegomyia under complete control the potential chain of yellow fever transmission was broken into links that have never come together again.

You also know that we have no more yellow fever in southern cities, although we now have from ten to twenty sources of stegomyia to every one that existed in the former high rate yellow fever years.

Likewise with malaria elimination, we now know that it is not essential to do away completely with malaria transmitting species of anopheles in order to reduce malaria to a point where it is no longer of any serious sanitary importance.

It can be proven that where satisfactory control measures are kept up, malaria transmission will finally die out. The malaria control activities conducted by Dr. Durrett and his co-workers have played a most important part in reducing the seasonal turnover in labor employed by the manufacturing interests of Memphis, and that in turn helped to increase the number of new industries that have been attracted and are being established here. Thus the cost of the anti-malaria activity is but a small fraction of the annual increased income it has brought to our city.

What other city has been so fortunate with regard to applied sanitation as to select a mayor who would personally spend ten days going from city to city of the Eastern states to study applied sanitation, and management of well directed city health departments, and then spend five months to be sure of selecting the best health director potentially available to care for the health of the citizens.

This pioneering effort of our present mayor, Rowlett Paine, is a standard that the medical profession should be proud to refer to, and should often mention, as it is one of the most important advances in modern municipal sanitation.

THE IMPORTANCE OF PLANTATION MALARIA TO MEMPHIS AND THE PLANTATION OWNER*

By H. A. JOHNSON,†
Memphis, Tenn.

The farming area immediately about Memphis is mainly of the so-called Delta plantation type. During the labor shortage that exists on plantations at crop gathering time large numbers of cotton pickers are recruited in Memphis for work in the field. This labor, in the Delta at a time when malaria is at the peak of its prevalence there, has abundant opportunity to become infected and to bring malaria back to the City. There is little doubt that much of the malaria seen in Memphis originates in this manner.

Notwithstanding the fact that a great deal of agitation is now being directed to diversifying southern farming operations, cotton will continue to be the main crop in the flat Delta lands where "plantation" farming is practiced.

Malaria is of vital importance to the plantation owner, because a larger part of the disease is confined to his area and because the disease strikes his labor at picking time when labor is always scarce.

In manufacturing industries every effort is made to keep labor fit. The profits of industry depend on the efficiency of labor, and we find that industrial establishments maintain hospital, welfare, and relief departments just to insure well and contented employes. They find it pays.

Plantation farming can be likened to a specialized form of industrial establishment. The cost of operating the plantation is made up among other things of fertilizer, seeds, implements, mules, and labor. Labor, however, is approximately 50 per cent of the production cost. We find the plantation owner studying methods, best use of implements, rotation of crops, markets, soforth. Why does he refuse to become interested in the one item that is 50 per cent of the total cost of production, labor?

Malaria strikes another definite blow at the plantation owner's profits. At the time when labor is scarcest, and cotton prices are highest, that is, at the beginning of the harvesting time, malaria is at its peak. The direct result is that harvesting is delayed, cotton is damaged by the weather, and a much lower average price is received for the year's crop.

If the plantation farmer is going to prosper, he must come to realize as manufacturing establishments have done, the potential profits that are his if he devotes interest and energy to making labor efficient.

A definite increase in the price received for the year's crop can be realized by malaria elimination, and other work devoted to keeping labor fit, and when the unnecessary expenses have been eliminated the plantation owner is going to find himself in a better position to meet the necessary obligations of his business, and the spread of malaria by his labor to the cities adjacent the Delta areas will cease to be of importance.

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*Clinic, Clinic Session, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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Southern Medical Journal
JOURNAL OF THE
SOUTHERN MEDICAL ASSOCIATION

Published monthly by the Southern Medical Association, Empire Building, Birmingham, Ala. Annual subscription $4.00. Single copies 35c each.

Entered as second-class matter at the Post Office at Birmingham, Ala., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1106, Act of October 3, 1917, authorized December 20, 1921.

DR. M. Y. DABNEY, Editor
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Vol. XXI SEPTEMBER 1928 No. 9

EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
Twenty-Second Annual Meeting
Asheville, North Carolina
November 12-15, 1928

THE ASHEVILLE MEETING
NOVEMBER 12-15

Apropos of the annual meetings, it has been said elsewhere in the JOURNAL that if the progressive physicians of the South were to meet in a desert, the sessions would prove scientifically profitable and those who attended would enjoy the association with one another. And at the same time the more attractive the meeting place the greater the enjoyment of the occasion, which is one of the most important events of the year in the lives of the physicians of the South. A charming resort meeting place like Asheville is "so much velvet" thrown into an event which is already of the highest intellectual value.

Asheville has grown remarkably even in the nine years since it last entertained the Southern Medical Association. It is a famous health and pleasure resort, sought by people from all parts of the country. The hundreds of thousands of persons who have gone to that city for health and recreation have aided in its expansion. Its highly skilled physicians have contributed greatly to its growth, since its medical society numbers many men of national reputation.

The program will follow the same plan inaugurated at Atlanta, which has proven successful for the past two years. The first day, Monday, will be taken up with clinics arranged by members of the local profession. Monday morning these will be held at the Government Hospital at Oteen, about five miles from Asheville. Arrangements will be made for transportation of the guests, who will leave Asheville at 9:00 a. m. Oteen is the largest hospital for tuberculosis owned and operated by the Government. No physician who has any interest in that disease will be willing to miss these clinics, which are a special feature of the meeting. The afternoon clinics in the City of Asheville proper also will be of great interest. The address of the distinguished President, Dr. William R. Bathurst, and the Orations on Medicine and Surgery will be given Monday evening. On Tuesday, beginning at 8:00 o'clock in the morning, the general clinics will be held. These are given by representative men carefully selected from various parts of the South by the President. They cover a wide range of subjects. In the past they have never failed to hold the attention of a large audience. Wednesday and Thursday will be taken up with the seventeen sections and conjoint meetings. These were of high type last year, and are expected to be better this fall, as each year that goes by adds more to the wisdom and experience of the members of the Association.

Arrangements for social gatherings have never failed to be pleasant at the Southern Medical meetings. There will be a general reception, alumni banquets, tournaments on the splendid golf links of Asheville, trap shooting, and entertainments for visiting ladies. There will be just enough entertainment to make this meeting complete: none to interfere with scientific activities.

Asheville has convenient train schedules connecting it with all parts of the South. There are year-round tourist rates, and there will be special round trip rates for the meeting. The exceptionally good highways of North Carolina will doubtless tempt many visitors to make the trip by automobile.

The hotels are capable of accommodating a large number of tourists. For best selection of rooms, however, it is advisable to make reservations early, either through the hotels directly or through Dr. F. Webb Griffith, Haywood Building, Asheville, Chairman of the Committee on Hotels.

ETHYLENE: PHYSIOLOGIC EFFECTS

In 1908, severe losses were sustained by carnation growers who shipped their products into Chicago, because the flowers in green houses "went to sleep," and the buds which were already showing petals failed to open. Botanists who studied the effect of illuminating gas on carnations found that ethylene, which makes up four per cent of the gas, is the chief toxic constituent for plants. One part of ethylene in two million parts of air caused the open flowers to close in twelve hours; and one part in one million prevented opening of the buds.[1]

Ethylene is a gas at ordinary temperatures. It may be stored as a liquid in tanks under pressure like nitrous oxid. It is an unsaturated hydrocarbon with the formula $CH_2:CH_2:$, being closely related to ethyl alcohol. The two carbon atoms are structurally depicted as linked together by a double bond, the "unsaturated" linkage, which makes an unstable and highly reactive compound. It is to this double bond that ethylene owes its explosive properties in certain concentrations of oxygen.

In very small quantities it affects plant protoplasm. The castor oil plant and sweet pea were shown to be sensitive to 0.00001 per cent in the air. On account of its marked toxicity to plants, and the fact that it occurs in illuminating gas, its effects upon animals were studied by Luckhardt and Carter,[1] in Chicago, who found it to be, however, non-toxic to animals and to be anesthetic. They used it in high concentrations upon frogs, white mice, rats, guinea pigs, rabbits, kittens, dogs, and man, and compared its effects with those of nitrogen, hydrogen, and nitrous oxid. Ethylene anesthetized all these animals more quickly than did nitrous oxid, and the recovery of the animals was rapid even after prolonged administration. The pulse rate of human subjects was observed to decrease when it was administered, respirations were slow and regular, the blood pressure was not affected, there was no cyanosis, asphyxia, or sweating, and the subject remained normal in color.

Since the work of Luckhardt and Carter there have been many other reports of the use of ethylene in major and minor surgical cases, and its effects have been extensively studied. It has an affinity for the blood fats but does not combine with hemoglobin. The fact that its boiling point (-157°F.) is lower than that of nitrous oxid (-137 F.) perhaps enables the body to dispose of it rapidly when administration is stopped.[2] It does not lengthen the time of coagulation of the blood, or the bleeding time.[3 4] It has been reported to increase the blood sugar less than other anesthetics,[5] and to lower the carbon dioxid-combining power of the blood less than do other anesthetics. Anesthesia in general tends to be followed by an increased percentage of blood sugar, and an acidosis, indicated by the reduced power of the blood to combine with carbon dioxid. Ethylene also has been said to be the only anesthetic which does not inhibit contractions of the isolated uterin muscle.[2] This should enhance its value in obstetrics.

Brumbaugh,[6] who studied its effects after prolonged anesthesia of normal subjects, reports among other findings an increase in blood urea twenty-four hours after anesthesia, and a rather large post-anesthesia morbidity. He has no comparable figures for the administration of other anesthetics over a similar period. Hence, it is at present difficult to evaluate his data.

Allen and Murray,[4] after a series of 2,750 cases, report that the margin of safety with ethylene is much greater than with nitrous oxid. Ross,[2] of Winnipeg, says that under ethylene anesthesia the patient is more normal than with any other anesthetic.

This gas represents undoubtedly a step forward in anesthesia. It should be used only by one thoroughly acquainted with its limitations and its explosiveness under very mild provocation.

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BACILLUS ABORTUS INFECTION IN HUMAN BEINGS

It used to be said that the physician attempting to diagnose cases of prolonged fever, should think of four diseases: typhoid fever, malaria, tuberculosis, and syphilis. Refinement of diagnostic methods has added to the number of possibilities which must enter the physician's

mind, and has shown several other infecting micro-organisms which may be the cause of obscure fevers. Tularemia, transmitted usually by handling rabbits infected with *Bacillus tularense,* may occasion a prolonged fever and death.[1] The cause of the condition will not usually be known unless the blood is examined by a laboratory equipped with tularense organism or antiserum.

Case reports in the literature have suggested that the organism of contagious abortion in cattle, widely spread in this country, may have a larger public health significance than has been assigned to it.[2 3] *Bacillus abortus,* (or *Brucella abortus*) the infecting agent, and *Bacillus* (or *Brucella*) *melitensis,* the organism carried by goats and causing Malta fever in human beings, are very similar culturally, morphologically and even serologically. They are cocco-bacilli, resembling cocci in pathological lesions, and in clltures are rods with rounded ends. They are non-motile, form no spores, and are Gram-negative. Their biochemical reactions are the same, and their serological reactions are very nearly alike. Both organisms are equally agglutinated by abortus anti-serum; but melitensis anti-serum agglutinates abortus in less high dilution than melitensis.[4]

If either organism is administered to pregnant guinea pigs abortion of a large proportion of the infected animals results. Abortion, it is well known, is the commonest symptom of cattle infected with *Bacillus abortus.* Also, one of the most important symptoms observed among goats affected with Malta fever is frequency of abortions.

In 1924, Keefer, in the *Bulletin of the Johns Hopkins Hospital,* reported a case of human infection with *Bacillus abortus,* and since then other cases in men and women in slightly increasing numbers have been described.

In human beings, both male and female, abortus infection has shown itself as an intermittent fever, of more or less severity, accompanied sometimes by diarrhea, sometimes by a cough which has suggested tuberculosis, or by rheumatic pains, lasting months or a shorter period.

The organism of Malta fever is transmitted to human beings through goat's milk. The organism of contagious abortion is also commonly found in the udders of cows. It has been said that it is always present in certified milk sold in certain regions, and, probably, it is common in raw milk throughout the country. The physician should be on the lookout for human infection with this organism, and since the clinical symptoms are not specific, he must depend usually upon laboratories in large centers of population to diagnose his cases.

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2. Scozzafave, I.; and Warner, W. P.: Brucella Abortus Infection in Man. Ca. Med. Ass'n Jour. 19:177, Aug. 1928.
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4. Evans, Alice: Further Studies in Bacterium Abortus and Related Bacteria. Jour. Inf. Dis. 22:580, 1918.

Asheville—Where We Meet

FISH AND GAME PRESERVES NEAR ASHEVILLE*

Those members of the Southern Medical Association who are interested in the conservation of game and fish for the perpetuation of fishing, hunting and other sports afield, will find that Western North Carolina is a happy hunting ground as a result of conservation measures. Five hundred thousand acres have been incorporated into the national forest reservations which have been established near Asheville. An additional tract of between 400,000 and 700,000 acres will be added to the game and forest reservation of this region by the establishment of the Great Smoky Mountains National Park.

Nearly 100,000 acres on the slopes of Mount Pisgah, near Asheville, have been devoted to a permanent game preserve under the administration of the United States Government. State game preserves of large size have also been established here. No hunting is allowed on these refuges and the surrounding territory benefits greatly by the overflow of game and birds. In the Pisgah Preserve 3,500 red deer, many elk, wild turkeys, bob white, and other game are given protection.

The State game refuges, although not so old as the Pisgah area, have been stocked with game and have proven their value as a means of game preservation. The entire tract of the Great Smoky Mountains National Park will be a great

*By John D. Topping, Publicity Director, Asheville Chamber of Commerce.

perpetual game refuge and will add much to the game and fish supply of Western North Carolina.

Streams in Western North Carolina have been stocked with bass and trout of various kinds. The larger lakes have also been stocked, Lake Lure and Lake Tahoma having received a quantity of the steel-head trout of the Northern lake region. Hunting and fishing are allowed within the national forest areas outside the game refuges in accordance with the State laws, and fishing is allowed within the refuges during certain regulated periods.

The national forests near Asheville are open to the public at all times. Campers, hunters, fishermen and lovers of the out-of-doors take advantage of these great outdoor playgrounds. November, the time set for the Convention of

Camping in the Pisgah National Forest near Asheville. The Forest offers miles of motor roads and bridal trails leading through magnificent scenery.

the Southern Medical Association, is a favorable season to visit the game refuge. At this time, with autumn coloring the forests and the mast falling from the oaks and beeches, the deer are most tame and may be seen by motorists driving through the Pisgah Game Preserve and other preserves of the section.

UNIQUE MOUNTAIN INDUSTRIES

Among the unique institutions characteristic of the Land of the Sky, the most interesting perhaps are the industries of the mountaineers. Potters, weavers of homespun, basket makers, wood carvers, rug makers and curio carvers ply their trades in the mountain cabins and market their wares in the shops of Asheville. The mountaineer in his purest and most characteristic type is rapidly disappearing as a result of the inroads of civilization. In the isolated coves the true man of the mountains is still to be found, although his near neighbors have succumbed to the influences of good roads and schools.

The crafts of the mountain people have been developed directly as a result of the interest taken in these folk by visitors in Asheville. Mountain weaving and wood carving were first sponsored by the late George W. Vanderbilt, creator of the famous Biltmore Estate at Asheville, and by Mrs. Vanderbilt. The weaving plant, established first in Biltmore, has been moved to a point near Grove Park Inn and now produces woolen homespun cloth which is sold in all parts of the United States. The material is made by mountain weavers operating hand looms. A wood carving plant manufacturing artistic wood carving and carved wood toys has been moved to Tryon, N. C., in the Blue Ridge region.

Many potters produce colored and plain pottery near Asheville. The workmen use the clays which are abundant in the mountains and execute very artistic pieces. Hooked rugs, woven work, coverlets, hand wrought iron work, furniture and the numerous types of baskets are among the articles displayed in Asheville shops. Visitors in the city find it very interesting to see the handwork of the mountain people, and in many instances to watch the articles being manufactured.

Of equal interest are the products of the Cherokee Indians, who are located on their reservation in the foothills of the Great Smoky Mountains. These Indians, the last of their tribe in the East, make gaily colored baskets, beads and other products of Indian art.

Book Reviews

Crawford W. Long and Ether Anesthesia. By Francis Long Taylor; 237 pages. New York: Paul B. Hoeber, Inc. Cloth, $4.00.

Mrs. Francis Long Taylor in writing the biography of her father presents indisputable facts which prove that he was the first to use ether as an anesthetic. In describing the events which led up to the discovery of ether anesthesia, and in her really thrilling account of its use in the first cases, Mrs. Taylor has given a very charming picture of the life of a highly educated, cultured physician of antebellum days. A daughter's love for a devoted father glows throughout the book, but she is fairer to those who would have deprived Dr. Long of the honors which he deserved than they merited. Mrs. Taylor's book should be read by, and have a permanent place in the library of, every physician who believes in justice and who feels a pride in Southern achievement.

The Heart in Modern Practice. By William Duncan Reid, A.B., M.D., Assistant Professor of Cardiology, Boston University, School of Medicine; Associate in Cardiology of the Evans Memorial; Cardiac Consultant to the Newton Hospital; Formerly Chief of Heart Clinic at the Boston Dispensary, Junior Assistant Visiting Physician and Member of the Heart Service at the Boston City Hospital, Assistant Visiting Physician to Out-Patients at the Massachusetts General Hospital. Second Edition, Revised and Enlarged. 466 pages with 81 illustrations. Philadelphia and London: J. B. Lippincott Company, 1928. Cloth, $6.00.

The new edition has been revised and enlarged. Because the author wished to discuss more in detail cardiac arrhythmias, he has devoted nine chapters to them in the present edition instead of the one chapter of the first edition. There are extensive revisions and enlargements in the sections on arterial hypertension and the differential diagnosis between hyperthyroidism with congestive heart failure and congestive heart failure from other causation.

The section on the treatment of cardio-vascular syphilis has been rewritten and the uses of bismuth included.

Rheumatic heart disease is presented in greater detail and has been revised so as to embrace the more recent ideas on the subject.

The inclusion of a good description of the circus movement is a real addition to the book.

There has been an amplification of the section on the physiology and technic of measurement of blood pressure.

The article on angina pectoris has been slightly enlarged, but could have been written in more detail with advantage. Coronary infarction also might have been allotted more space.

The portions dealing with the Adams-Stokes syndrome, digitalis, quinidin and bacterial heart disease have been amplified. The uses of adrenalin and barium chlorid in the treatment of Adams-Stokes syndrome is discussed.

The section on the treatment of cardiac edema and ascites has been revised and the uses of merbaphen, urea and calcium are presented.

The first edition of this book was destined to fill a useful purpose, and it has been improved by its present revision and enlargement.

Special Cytology, The Form and Functions of the Cell in Health and Disease. A Textbook for Students of Biology and Medicine. By sundry contributors, edited by Edmund V. Cowdry, The Rockefeller Institute for Medical Research. In two volumes with 693 illustrations. Volume I, pages 1 to 702. Volume II, pages 703 to 1348. New York: Paul B. Hoeber, Inc., 1928. Cloth, $20.00.

These two volumes contain authoritative information of various cells and tissues, given by thirty-five different investigators, each of whom through his own researches has personal knowledge of the subject on which he writes. The investigators have, one and all, resorted to a study of the fundamental living units, that is to say, of the cells of the tissues with which they are concerned. It is refreshing for the student to be led by different people into their chosen fields, in language which is their own. The editor, Dr. Cowdry, has recognized that the day has passed when such ground can be adequately covered by a single author.

The purpose is to present a detailed statement of the types of cells which make up the body and which serve different functions. To this end, there are thirty-seven different sections, each a monograph in itself, such as that upon the pineal gland, the sympathetic nerve cells, the suprarenal bodies, the erythrocyte, the pancreas, the cells of the cortical pathways, the epithelium of the respiratory tract, the mammary gland, and others.

Research on the cells of the body and their functions has resulted in a rich accumulation of facts, so detailed as to be without the personal knowledge of any one individual. Here, within two volumes, all of this experience and data are condensed and correlated for the student by master scientists. It merits desk space at the right hand of every biologist, medical teacher and student.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles on Treatment, Medicine, Surgery, Neurology, Pediatrics, Obstetrics, Gynecology, Orthopedics, Pathology, Dermatology, Ophthalmology, Otology, Rhinology, Laryngology, Hygiene, and other topics of interest to Students and Practitioners. By leading members of the Medical Profession throughout the world. Volume I, March, 1928. Thirty-eighth Series, 307 pages, illustrated. Philadelphia and London: J. B. Lippincott Company, 1928.

A diversity of subjects is covered in this volume, and only a few are worthy of special mention. "Bacterial Heart Disease," by William D. Reid, although adding nothing new to the subject is a good summary of present knowledge. "Changes in the Clinical Picture of Syphilis as a Result of Augmentation of the Vascular and Nervous Symptoms and the Cause Thereof," by James Strandberg, and the "Pathogenesis of Gastric and Duodenal Ulcer," by E. Starr Judd are also worth mentioning. Other articles are at best adequate.

A Manual of Surgical Anatomy. By Charles R. Whittaker, F.R.C.S. (Ed.), F.R.S.E., Assistant Lecturer on Anatomy, Surgeons' Hall, Edinburgh; Examiner, Royal College of Surgeons, Edinburgh. Fourth Edition, Revised and Enlarged. 471 pages, illustrated. New York: William Wood & Co., 1928. Cloth, $5.00.

The purpose of a manual, that is, to be simple and brief, yet complete, and to be arranged for ready reference, is well met in this volume. The text is in lecture form and essential illustrations are included. It is accurate and extremely well written. The book is excellent for studying or for rapid reference when minor details are not sought.

A Text-Book of Infectious Diseases, being the Third Edition of Goodall and Washbourn's Manual of Infectious Diseases. Revised and in large part re-written by E. W. Goodall, O.B.E., M.D., B.S. Lond., Member of the General Nursing Council of England and Wales; Vice-President, formerly President, of the Section of Epidemiology and State Medicine of the Royal Society of Medicine. 718 pages with 26 plates (including six colored) and other illustrations, 15 diagrams and 34 charts. New York: William Wood and Co., 1928. Cloth, $10.00.

This is a modernized edition of an old English textbook. It is up to date in every respect and is well written and well gotten up.

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*Deceased.

Southern Medical News

ALABAMA

Work has been started on the construction of a $100,000 hospital unit in connection with the Partlow State School for Mental Defectives, Tuscaloosa. This will be an addition to the old Bryce Hospital and will be three stories.

Deaths

Dr. Wyatt T. Hodges, River View, died April 28.

Dr. Richard Albert Wall, Forest Home, aged 58, died May 28 in Montgomery of heart disease.

Dr. Robert Nelson, Empire, aged 51, died May 3 at Birmingham of pneumonia.

Dr. John Elijah Martin, Brewton, aged 79, died March 12 of angina pectoris and arteriosclerosis.

ARKANSAS

Councilor District No. 9 Medical Society was organized recently in Harrison. Dr. J. F. John, Eureka Springs, was elected President; Dr. E. G. Fendley, Leslie, First Vice-President; Dr. J. I. Thompson, Yellville, Second Vice-President, Dr. J. H. Fowler, Harrison, Secretary-Treasurer. Counties included in this district are Boone, Baxter, Carroll, Marion, Newton, Searcy, Stone, and Van Buren.

Dr. Gordon Hastings, El Dorado, and Miss Agatha Dodson, Minden, Louisiana, were married June 23.

Dr. S. J. Wolfermann, Fort Smith, and Miss Elizabeth Moulton were married June 6.

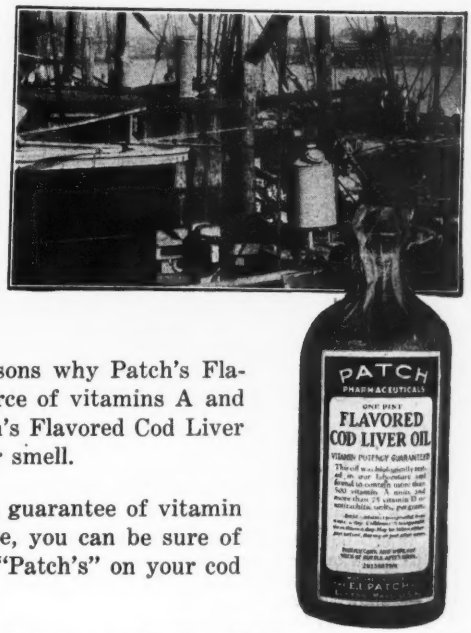
Deaths

Dr. John E. Mitchell, Havana, aged 66, died May 11 at a hospital in Little Rock of hypostatic pneumonia, following an appendectomy.

(Continued on page 34)

The Deep Sea Cooker

Out on the north Atlantic you may see the steam trawlers on their fish quest—sturdy boats that defy the anger of the ocean to reap the harvest of the deep.



Numbers of these steam trawlers are now distinguished by a new piece of "gear."

This is the Patch Cod Liver Oil Cooker, in which the oil is extracted from the livers right when the fish are caught—one of the reasons why Patch's Flavored Cod Liver Oil is so sure a source of vitamins A and D; also one of the reasons why Patch's Flavored Cod Liver Oil is free from objectionable taste or smell.

Every bottle of Patch's carries a guarantee of vitamin potency, both of A and D. Therefore, you can be sure of full therapeutic effect if you specify "Patch's" on your cod liver oil prescriptions.

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Boston, Mass.

Please send me a sample of Patch's Flavored Cod Liver Oil and literature.

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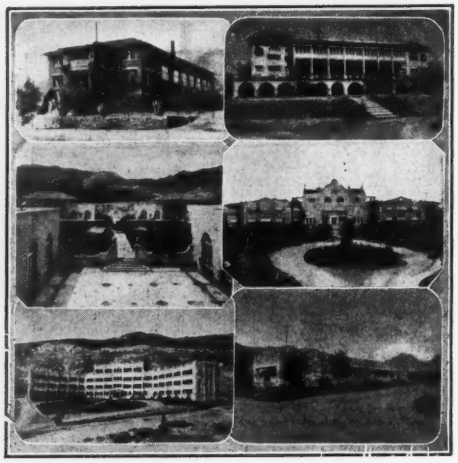

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Please send me your two free booklets, "Filling the Sunshine Prescription" and "El Paso, in the Land of Better Living."

Name.....

Address.....

(Continued from page 786)

Dr. John R. Davis, Fort Smith, aged 60, died April 5 of edema of the lungs and acute dilatation of the heart.

Dr. Ernest Porter Hopper, Marked Tree, aged 40, died June 6 of acute myocarditis.

Dr. John Walker Morton, Fort Smith, aged 78, died May 20 of sarcoma of the liver.

DISTRICT OF COLUMBIA

Dr. John C. Eckhardt was recently appointed Research Physician for the Washington Child Research Center.

Dr. Manual Sherman, Director, Washington Child Research Center, has been appointed Lecturer on Child Development at George Washington University.

Deaths

Dr. Montgomery Hunter, Washington, aged 64, died May 28 of myocarditis and arteriosclerosis.

Dr. John Crayke Simpson, Washington, aged 69, died suddenly June 6 of heart disease.

FLORIDA

St. Lucie-Okeechobee-Indian River-Martin County Medical Society has elected the following officers: Dr. J. A. Newnham, Stuart, President; Dr. E. B. Hardee, Vero Beach, Vice-President; Dr. C. L. Davis, Okeechobee, Secretary.

The Volusia County Woman's Auxiliary was recently organized. The following officers were elected: Mrs. J. E. Taylor, DeLand, President; Mrs. Ralson Wells, Daytona Beach, Vice-President; Miss Martha West, DeLand, Secretary-Treasurer.

The second bi-annual meeting of the Florida East Coast Medical Association was held at Miami May 31-June 1.

Dr. N. A. Upchurch, City Health Officer of Jacksonville, has been elected President of the Food and Drug Officials of the Southeastern States.

Dr. Ralph Greene, Jacksonville, in his capacity as Lieutenant-Colonel, Medical Reserve Corps, U. S. Army, has been detailed to a tour of duty at the School of Aviation Medicine, Brooks Field, San Antonio, Texas.

Dr. M. B. Herlong, Jacksonville, has been elected Chairman of the City Commission. He has served as Health Commissioner of Jacksonville for several years.

Dr. E. C. Levy, Tampa, has returned to Richmond, Virginia, after having served for three years as Chief Health Officer of Tampa.

Deaths

Dr. G. W. Barnard, Pinetta, aged 76, died May 9 of arteriosclerosis.

Dr. Charles Braxton McKinnon, DeFuniak Springs, aged 62, died June 8 of cerebral hemorrhage.

GEORGIA

The Chattahoochee Valley Medical and Surgical Association held its twenty-eighth annual meeting in Warm Springs July 10-11. Dr. W. J. Love, Opelika, Alabama, was elected President; Dr. John A. Keyton, Dothan, Alabama, First Vice-President; Dr. F. B. Blackmar, Columbus, Second Vice-President; Dr. C. W. Roberts, Atlanta, Secretary-Treasurer.

The recent commencement of the Medical Department of the University of Georgia, Augusta, marked the centennial of the founding of the School, and the graduation of its ninety-eighth class, no classes having been graduated for two years during the Civil War. The Alumni Association of the Medical School, which met during the celebration, voted to conduct a campaign for $300,000 to erect an alumni memorial building. The following officers of the Alumni Association were elected at this meeting. Dr. Robert L. Miller, Waynesboro, President; Dr. Guy T. Bernard, Augusta, Vice-President; Dr. George Lombard Kelly, Augusta, Secretary-Treasurer, re-elected.

Dr. T. C. Davison, Atlanta, was recently elected President of the Medical Alumni of Emory University, and Dr. M. C. Pruitt, Atlanta, Secretary.

(Continued on page 36)

We are Telling Them

General medical journals carry our message to the practitioner that you, the roentgenologist, can help him to quicker, more accurate diagnoses. In *Hygeia* we are telling an intelligent, "health-conscious" group of laymen what x-rays can do to maintain health. We are doing this in a conservative and ethical manner.

We are prompted to do this by the belief that the value of the x-ray examination warrants a very much more universal and frequent use of it. We believe the x-ray examination is a legitimate part of the examination of the supposedly healthy individual. As far as we know our beliefs are your own. We are joining you in the crusade for more accurate diagnosis scientifically arrived at.

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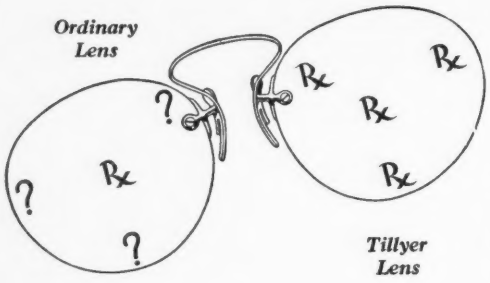

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TILLYER LENSES

Accurate to the very edge

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(Continued from page 34)

Dr. Lawson Thornton announces the opening of a Fracture and Orthopedic Clinic at Piedmont Hospital.

Dr. W. H. Powell, formerly of Lumber City, has moved to Brunswick and purchased an interest in the hospital of Dr. W. M. Odum.

Dr. J. F. Pitman, formerly of Atlanta, is now in charge of the X-ray Department of the John D. Archbold Hospital, Thomasville.

Dr. M. A. Fort, Bainbridge, Commissioner of Health for Decatur County, had the degree of Doctor of Public Health conferred upon him by the University of Georgia Medical Department, Augusta, at its recent commencement exercises. He submitted a thesis on "A Comprehensive Investigation of Hookworm Conditions in Georgia."

Dr. W. H. Goodrich, Augusta, has been re-elected Dean of the University of Georgia Medical Department.

Dr. Thomas A. Spears, Atlanta, and Miss Mildred Curtis were married recently.

Deaths

Dr. J. Lee Byron, Jackson, aged 78, died June 18 after an illness of two years.

Dr. Eugene A. Harris, Sandersville, aged 52, died very suddenly at his home June 18.

Dr. LeRoy J. Simpson, Atlanta, aged 76, died May 30 of cardio-vascular-renal disease.

Dr. William White Evans, Oxford, aged 82, died May 27 at the Wesley Memorial Hospital, Atlanta.

Dr. Thomas H. Cox, Americus, aged 70, died May 30 in a hospital at Atlanta.

Dr. Samuel Gaines Ethridge, Sparks, aged 64, died June 15 of paralysis.

KENTUCKY

Pending the appointment of a Dean for the School of Medicine of the University of Louisville, the Board of Trustees has appointed a committee to perform the duties of Dean consisting of Dr. Irvin Abell, S. I. Kornhauser, Ph.D., and Dr. John W. Moore. Dr. Stuart Graves, former Dean of the School, resigned to accept a similar position at the University of Alabama School of Medicine, Tuscaloosa, Ala.

The Third District Medical Society, at its recent meeting, elected Dr. William A. Guthrie, Franklin, President.

The Southwest Medical Association held its fifty-eighth annual meeting at Paducah May 8. Dr. Edward B. Houston, Murray, was elected President.

Dr. E. Murphy Howard, Jr., Harlan, and Dr. Lawrence T. Minish, Frankfort, have been appointed members of the State Board of Health for a period of four years, succeeding Dr. Joseph E. Wells, Cynthiana, and Dr. James W. Kincaid, Cattlesburg.

Dr. Millard D. Hoskins has been appointed Full-Time Health Officer for Bell County.

Dr. William N. Bailey, White Plains, celebrated his seventieth birthday with a "real old-fashioned country dinner" at his home May 24.

Dr. James A. Averdick, Covington, received the honorary degree of Doctor of Laws at the annual commencement of the University of Dayton (Ohio) in June.

Deaths

Dr. Richard W. Duke, Hueyville, aged 53, died June 16 at a hospital in Pikeville.

LOUISIANA

The Louisiana State Pediatric Society met in Baton Rouge April 9. The following officers were elected: Dr. L. R. DeBuys, New Orleans, President; Dr. Emile Naef, Baton Rouge, Vice-President; Dr. C. T. Williams, New Orleans, Secretary-Treasurer.

The tenth annual spring meeting of the Sixth District Medical Society was held June 27 at Baton Rouge. Dr. T. C. Paulsen, Baton Rouge, was elected President; Dr. Guy Riche, Baton Rouge, Vice-President; Dr. T. J. McHugh, Baton Rouge, Secretary-Treasurer.

The following Assistant Surgeons, Reserve Corps, United States Public Health Service, have been ordered to active duty and directed to New Orleans Marine Hospital: Drs. Jacques P. Gray, William F. Ossenfort, Kenneth R. Nelson, Joseph O. Dean, Herbert G. Brehm, Ivan W. Steele, Oswald F. Hedley, James W. Bryan, James T. Jackson, Walter P. Griffey, Vane M. Hoge, Raymond L. Evans, Russell S. Wolfe, Guy V. Gooding and Joseph W. Christie.

(Continued on page 38)

Are you taking advantage of Knox Sparkling Gelatine—

a valuable dietary adjunct for diabetic patients?

BECAUSE plain unflavored gelatine blends perfectly with all fruits, vegetables, meat and fish, it is ideally suited to lend variety and palatability to the diabetic diet. Portions too small to serve alone can be made into satisfactory dishes with the addition of Knox Sparkling Gelatine.

With Knox Sparkling Gelatine a number of pleasing variations can be introduced into the diabetic diet—dishes that have high protein or fat value, are appetizing, and impart a sense of satiety to the patient. Made plain and pure—unbleached, without flavoring, coloring, or sugar content, Knox Sparkling Gelatine is an ideal food for the purpose. These qualities, also, make it a desirable means of lessening the monotony of liquid and soft diets in general.

In infant feeding, the protective colloidal ability of Knox Sparkling Gelatine in overcoming imperfect milk digestion has long been known. Exhaustive tests have proved that the addition of 1% of pure, unflavored gelatine to cow's milk tends to prevent regurgitation, gas, colic, diarrhea, and malnutrition. In fact, Downey has demonstrated that the addition of gelatine increases the available nourishment of milk mixture, by about 23%.

Knox Sparkling Gelatine is manufactured by a concern with 40 years of experience in making this one product. From raw material to finished product, every step in its manufacture is under constant chemical and scientific control. The most sanitary conditions prevail throughout the factory.

Valuable booklets on dietetics available

The booklets included below have been prepared by recognized dietetic authorities. They contain important data on the use of Knox Sparkling Gelatine in the various diets, together with recipes for a variety of tempting, appetizing dishes. Surgeons, doctors, dieticians, and members of hospital staffs will find them valuable references. Check those you would like to have and mail us the coupon.

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Knox Sparkling Gelatine is a protein in its purest form, particularly suitable where carbohydrates and acids must be avoided. It contains more than 80 per cent pure protein (4 calories per gram).

Specify Knox when you prescribe gelatine and you will protect the patient from brands unsuitable for his dietary purposes.

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- ☐ Diet in the Treatment of Diabetes
- ☐ The Value of Gelatine in Infant and Child Feeding
- ☐ The Health Value of Knox Sparkling Gelatine

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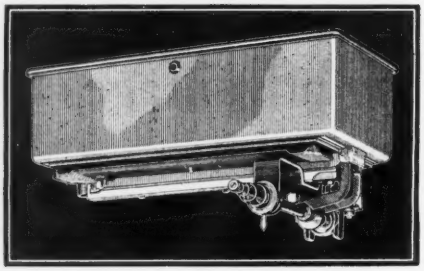

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with half the wear!

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This enormously enlarged heating area not only cuts boiling time in half, but adds years of service through lessened strain. The amount of wattage per square inch is but a third of that in the ordinary concentrated element.

If you need a new Sterilizer, you need this newest achievement in Sterilizer building. Complete details gladly mailed on request.

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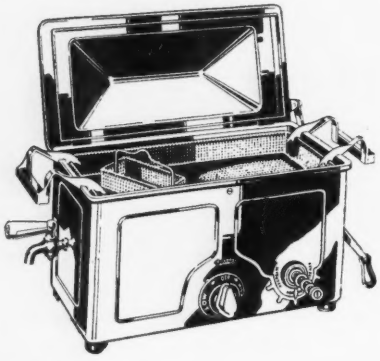

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(Continued from page 36)

Dr. C. P. Munday, Acting Assistant Surgeon, has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, Carville.

Dr. G. W. McCoy, Surgeon, U. S. P. H. S., has been ordered to proceed from Washington, D. C., to Carville for conference relative to cases of leprosy.

Dr. R. G. Townsend, Assistant Surgeon, U.S.P.H.S., has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, Baltimore, Maryland.

Dr. W. L. Barnes, Assistant Surgeon, U.S.P.H.S., has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, San Francisco, California.

Dr. L. C. Watkins, Assistant Surgeon, U.S.P.H.S., has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, Norfolk, Virginia.

Dr. A. P. Rubino, Assistant Surgeon, U.S.P.H.S., has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, San Francisco, California.

Dr. O. E. Denney, Surgeon, U.S.P.H.S., Carville, has been directed to proceed to Jacksonville, Florida, and other points in Florida to assist the State Health Officer in making a diagnosis of suspected lepers and to accompany patients diagnosed as lepers to Marine Hospital, Carville.

Dr. P. A. Neal, Assistant Surgeon, U.S.P.H.S., has been relieved from duty at Marine Hospital, New Orleans, and assigned to duty at Marine Hospital, Mobile, Alabama.

Deaths

Dr. Albert Sidney Johnston Hydge, Roseland, aged 43, died June 7.

Dr. Edward Davies, Mansfield, aged 90, died May 26 of carcinoma of the stomach.

Dr. Charles Sumner Collins, Houma, aged 49, died May 5 of cerebral hemorrhage.

(Continued on page 40)

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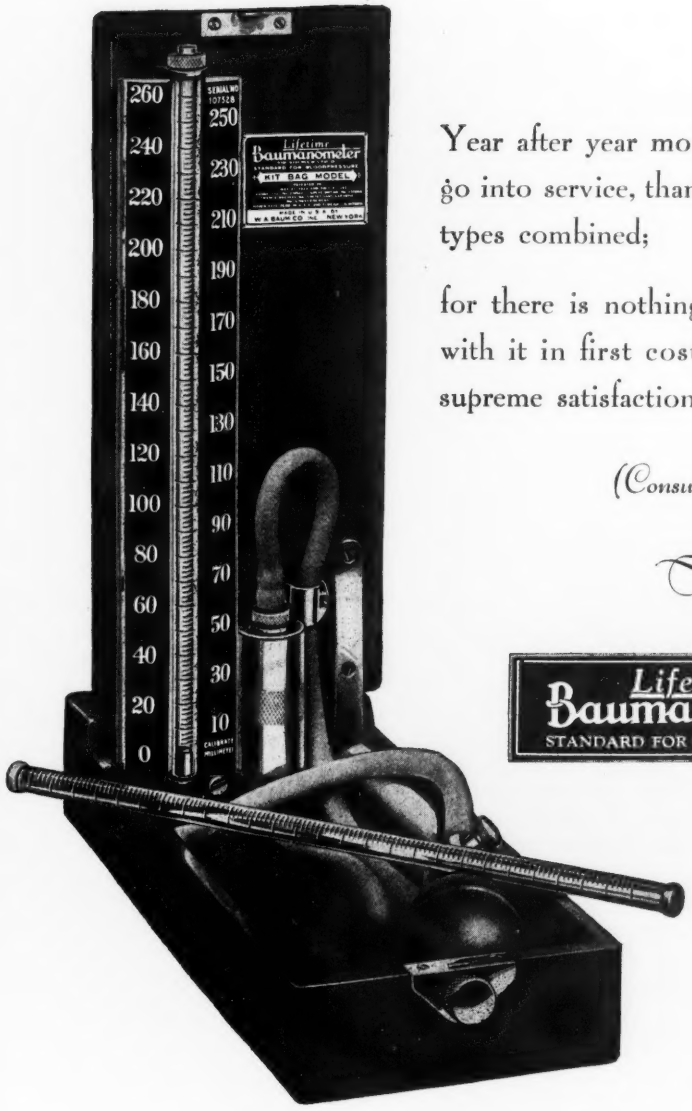

Year after year more Baumanometers go into service, than all other mercury types combined;

for there is nothing which compares with it in first cost, last cost and in supreme satisfaction.

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STANDARD FOR BLOODPRESSURE

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Every physician, no matter what his specialty, or the character of his regular active practice, needs the best aids to proper diagnosis.

The Eye, Ear, Nose and Throat—and the body cavities reveal many focal infections and diseased conditions that cannot be properly found without regional illumination.

This being undoubtedly true, then the best means of proper illumination for convenient use at the home, the bedside or in the office should be found. The answer is:

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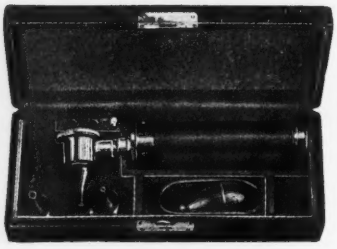

The Leading OTOSCOPE

This Otoscope has the largest lens disc and best lamps used in instruments of its type, and provides magnification and easy observation for diagnosis, operative work or testing the mobility of the ear drum.

☐ No. 200 Otoscope Head, Three Specula, Bulb, Battery Handle in Case.

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☐ No. 201 Otoscope Head only, with Three Specula and Rubber Bulb.

$13.50

DOSTER-NORTHINGTON, Inc.

Department of Surgical Instruments and Hospital Supplies

Birmingham, Ala.

(Continued from page 38)

MARYLAND

At the recent meeting of the Medical Society of Virginia, Maryland and the District of Columbia, Dr. John E. Sansbury, Forestville, was elected President; Dr. William T. Davis, Washington, D.C., Secretary.

At the fifty-second commencement of Johns Hopkins University, an anonymous gift of $500,000 for the Welch Medical Library was announced, which enabled the University to meet certain conditions laid down last year when the General Education Board gave the library fund $750,000 for the construction of the building and pledged $250,000 for its endowment. An anonymous gift of $20,000 was also announced for the support of work in psychiatry under the direction of Dr. Adolf Meyer, Baltimore; and $100,000 was given by an anonymous donor to be used for the Wilmer Eye Clinic. Among the gifts announced for fellowships and research assistants were $3,800 from the Commonwealth Fund for two years in pediatrics; $15,000 from the Commonwealth Fund for three years in psychiatry; $3,000 from the General Education Board for laryngology; and $1,000 from the Rockefeller Institute, New York, for neurology.

According to the Superintendent of the Johns Hopkins Hospital, Baltimore, Dr. Winford H. Smith, the institution needs additional facilities for the care of persons unable to pay the entire cost of hospital treatment. In the program of enlargement several years ago, a scheme was included whereby the reconstruction of two old wards would provide a new medical clinic and the enlargement of three wards would provide a new surgical clinic, each clinic having a capacity of 200 beds instead of the eighty-five now in the wards. Approximately 40 per cent of the patients in these wards pay nothing for treatment and the remainder pay about half the amount it costs the Hospital. It will cost about $1,300,000 to remodel the old wards to accommodate the new medical and surgical clinics. An endowment of $3,000,000 will be necessary to support the new units. When the entire

(Continued on page 42)

HASLAM'S

Surgical Instruments are correct in finish, pattern and quality

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Best for use and length of service.

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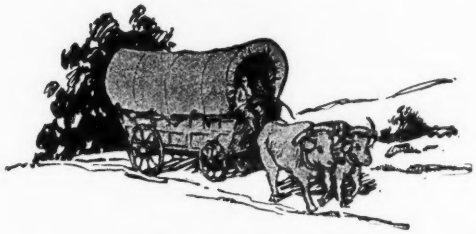

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LET US SEND SAMPLES, SUGGESTED FEEDING TABLES and DATA!

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THE DRY MILK CO. **18 PARK ROW, NEW YORK, N. Y.**

Results—

Physicians are securing satisfactory results from the use of this new Milk Modifier, which is more than a mere sugar.

Horlick's Milk Modifier

augments the nutritive value of cow's milk by the addition of these valuable elements derived from choice barley and wheat:

1. **Carbohydrates — Maltose 63% dextrin 19%.**
2. **Cereal protein, an effective colloid for casein modification.**
3. **Mineral elements.**

Directions and circulars are supplied to physicians only

Samples Prepaid on Request to

Horlick, Racine, Wisconsin

(Continued from page 40)

improvement program is completed the capacity of the Hospital will be 1,000 beds, approximately 700 more than there were in the original group of buildings.

The Baltimore City Department of Health recently moved into the new municipal building next to the City Hall, where it occupies all the seventh, eighth, ninth and tenth floors, a section of the first floor and part of the thirteenth floor and the basement. The administrative office, bureau of communicable diseases and the epidemiologic department occupy the eighth floor; the bureau of nursing and the bureau of child welfare, the seventh floor; the bureau of chemistry and food, the ninth floor; and the bureau of bacteriology, the tenth floor.

Contracts were recently awarded for the construction of the Memorial Hospital, Cumberland, which call for an expenditure of $448,000. Work will be started soon.

Dr. Hugh H. Young, Baltimore, was awarded a fellowship by the Royal College of Surgeons of Ireland in August. Dr. Young sailed for Europe June 20.

Dr. George H. Preston, Baltimore, has been appointed Commissioner of Mental Hygiene of Maryland. He succeeds the late Dr. Arthur P. Herring.

Dr. George H. Ramsey has been appointed Associate Professor of Epidemiology in the Johns Hopkins University School of Hygiene and Public Health; Dr. Lloyd W. Ketron has been appointed Associate Professor of Clinical Dermatology at Johns Hopkins University School of Medicine, and Dr. George E. Bennett, Associate Professor of Orthopedic Surgery.

Dr. Timothy A. Callahan has been appointed Health Officer of Harford County. This makes the ninth county in the State to have full-time health service.

Dr. John M. T. Finney has been elected President of the Community Fund of Baltimore.

Dr. John Eager Howard and Miss Lucy J. Iglehart, both of Baltimore, were married at Garrison Forest June 30.

(Continued on page 44)

PRECISION SYNCHRONOUS MICRO TIMER

PRECISION CORONALESS

Precision Synchronous Micro Timer with Oil-Immersed Circuit Breaker on wall panel for remote installation.

The only Timer—covering full radiographic range—equipped with Synchronous motor.

The motor—a miniature of the X-Ray Generator Motor—maintains constant speed, and is unaffected by voltage fluctuations.

In Radiography, especially in stereoscopic exposures of the chest, accurate timing is of utmost importance.

The inherently stabilized Precision Synchronous Micro Timer gives accurate and dependable service in three ranges—low, from 0 to 3 in 1-20 second gradations; high, from 0 to 30 in ¼ second gradations; and unlimited scale.

Write for Complete Information and Prices

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***Exclusive Manufacturers of* PRECISION CORONALESS X-RAY APPARATUS**

AMERICAN

HAYFEVER

All Sections——NORTH—EAST—SOUTH—WEST——*All Seasons*

Adequately and accurately covered by

ARLCO-POLLEN EXTRACTS

for Diagnosis and Treatment

AN ARLCO-POLLEN COLLECTOR

TREE HAYFEVER can be accurately identified by skin test with the pollens of locally prevalent trees and thereby differentiated from the "common colds" of early spring.

GRASS HAYFEVER begins about the time *tree hayfever* ends, *viz.* May 15th, and need not be confused with the earlier appearing and sometimes overlapping tree hayfever.

WEED HAYFEVER—August to frost—is unrelated to the previously occurring *grass hayfever* and is occasioned, according to the locality, by such late pollinating plants as the Ragweeds—Russian Thistle—Western Water Hemp—Carelessweed—or Sage Brush.

LIST of pollens for any section—any season—with commentary circular discussing the treatment of hayfever by *preseasonal* or *coseasonal* method, with respective schedules of dosage—sent on request.

THE ARLINGTON CHEMICAL COMPANY

Yonkers, N. Y.

(Continued from page 42)

Deaths

Dr. John William Lacy, Lisbon, aged 00, died January 21.

MISSISSIPPI

The following compose the staff of the South Mississippi Charity Hospital, Laurel: Dr. R. H. Foster, Superintendent; Dr. C. J. Lewis, Assistant Superintendent; Dr. J. R. Johnson and Dr. E. S. Roberts, House Physicians.

Steps are being taken to hasten the completion of the new Mississippi State Hospital for the Insane at Fondren. Already $1,250,000 has been expended and it is expected that the total cost of construction will reach two million. Most of the work is being done by convicts and inmates of the insane asylum, so that the cost of construction is materially reduced.

Deaths

Dr. William J. Dodson, Dossville, aged 76, died January 25 of organic heart disease.

Dr. Charles J. May, Poplarville, aged 54, died May 27 at the Elizabeth Sullivan Memorial Hospital, Bogalusa, Louisiana, as the result of injuries received in an automobile accident.

Dr. Charles Horace Ramsay, Collins, aged 69, died in May of heart disease.

MISSOURI

The Southeast Missouri Medical Association will hold its next annual session at Farmington October 22.

Construction of the McMillan Eye, Ear, Nose and Throat Hospital, St. Louis, waits the financing of equipment and maintenance. The building proper was provided for in the will of Mrs. Eliza McMillan thirteen years ago. Her bequest has been spoken of as $1,000,000. At commencement exercises of Washington University School of Medicine, St. Louis, Dr. Lee Wallace Dean was appointed Professor of Otolaryngology of the projected hospital.

A bed for messenger boys in St. Luke's Hospital, St. Louis, has been given a $5,000 endowment by Mrs. George F. Bergfeld in memory of her husband, who was a real estate dealer.

Mr. M. B. Pettibone, banker, has given $100,000 for an addition to Levering Hospital, Hannibal.

Dr. William M. West has opened his new hospital at Monett.

The new $50,000 negro tuberculosis sanatorium at Mount Vernon was recently opened.

The Missouri University Medical School Alumni has elected Dr. Frank I. Ridge, President; Dr. A. W. McAlester, Kansas City, Vice-President.

The Nursing School of the St. Mary's Hospital group, founded in 1907, was recently taken over by St. Louis University. A three-year course for a certificate in nursing and a five-year course for the degree of Bachelor of Science in nursing will be offered. A nurses' home is to be built south of the medical school.

Dr. E. Lee Myers, St. Louis, has left to attend the Congress of Oto-Rhino-Laryngology held in Copenhagen, Denmark. He will return some time in October after a tour of the medical clinics in Europe.

Dr. James Harvey Jennett has been appointed Night Superintendent of the General Hospital, Kansas City, and Dr. John S. Knight, Assistant Superintendent.

Mrs. C. H. Neilson, St. Louis, wife of the President

(Continued on page 46)

Lactic Acid Milk that is—

Uniform, Practical and Easily Prepared

In addition to Powdered Whole Lactic Acid Milk Merrell-Soule offers:

KLIM
POWDERED WHOLE MILK

—whole milk to which nothing has been added and from which only the water content has been removed. It is uniform as to composition—low in bacteria count—safe and practical for infant feeding.

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This is the dehydrated equivalent of Finkelstein's original Eiweissmilch. Sustained pediatric recognition and approval testify to the fact that Merrell-Soule Powdered Protein Milk has a definite place in infant feeding.

(Recognizing the importance of scientific control, all contact with the laity is predicated on the policy that Merrell-Soule Powdered Whole Lactic Acid Milk and its allied products be used in infant feeding only according to a physician's formula.)

MERRELL-SOULE Powdered Whole Lactic Acid Milk offers a convenient means of avoiding the tedious and none too accurate methods employed by many mothers in preparing Lactic Acid Milk.

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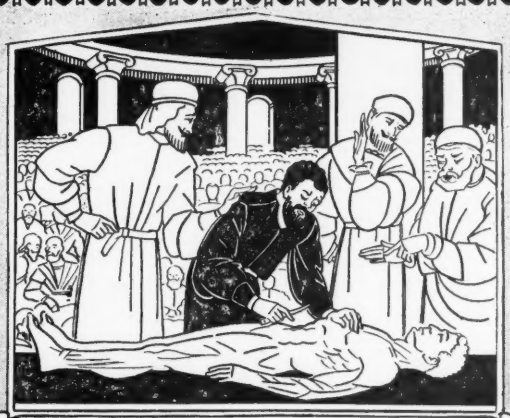

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(Continued from page 44)

of the St. Louis Medical Society, made the highest grade ever made in the Women's Safe Drivers' School, conducted by the St. Louis Safety Council. Her average was 99 1/3. This won her a silver cup.

Dr. George W. Becker has resigned as Police Department Surgeon in St. Louis after twelve years' service to make the race for nomination for Coroner.

Dr. Edwin P. Lehman, Washington University Medical School, St. Louis, has been appointed head of the Department of Surgery and Gynecology in the University of Virginia Department of Medicine, Charlotteville.

Dr. John B. Carlisle, Sedalia, was recently appointed Assistant Division Surgeon of the Missouri Pacific Railroad.

Deaths

Dr. Frederick H. Aufderheide, St. Louis, aged 87, died June 9 of arteriosclerosis.

Dr. Jefferson D. Brummall, Salisbury, aged 67, died May 4 of cerebral hemorrhage.

Dr. Charles A. May, Maplewood, aged 76, died June 14 at a hospital in St. Louis of cholelithiasis and emphysema.

Dr. David Taylor Mangus, Moberly, aged 55, died April 12 of chronic interstitial nephritis.

Dr. Allen Lowery Porter, Kansas City, aged 51, was killed in May in an automobile accident.

Dr. A. J. Jamieson, Winona, aged 79, died January 26 of chronic cystitis and prostatitis.

Dr. Robert Martin Bugg, West Plains, aged 58, died January 31 of chronic myocarditis.

Dr. Frank M. Barnes, Milan, aged 71, died April 15 of cerebral hemorrhage.

Dr. George R. Thompson, St. Joseph, aged 73, died

(Continued on page 48)

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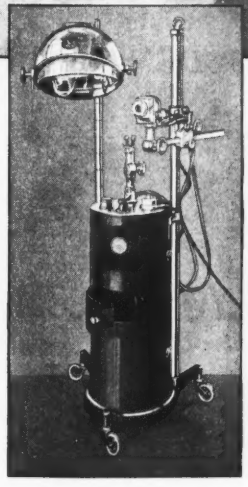

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NEW ORLEANS, LA.

(Continued from page 46)

May 25 at the Missouri Methodist Hospital of pneumonia.

Dr. Oba Chesley McBride, Licking, aged 56, died June 6 of cerebral hemorrhage.

Dr. Edward Lawrence Chambliss, Kansas City, aged 57, died May 19 of pneumonia at St. Joseph's Hospital.

Dr. David Ellsworth Furnall, St. Louis, aged 55, died June 2 at St. John's Hospital of streptococcus viridans infection.

Dr. William Anderson Copeland, Farmington, aged 69, died January 30 of general arteriosclerosis.

NORTH CAROLINA

Dr. John Wesley Parker, Jr., Seaboard, and Miss Josephine Ballou Dixon were married in Richmond, Virginia June 27.

Dr. Rufus H. Reitzel, Siler City, and Miss Jessie James, Richmond, Virginia, were married March 10.

Deaths

Dr. John Melvin Newbern, Jarvisburg, aged 60, died April 30 at a hospital in Norfolk, Virginia, of chronic nephritis.

Dr. George Sturtevant MacPherson, Asheville, aged 62, died May 24 of paralysis agitans.

Dr. Richard Dillard, Jr., Edenton, aged 70, died May 14 of chronic myocarditis.

Dr. Robert Lee Warren, Dunn, aged 40, died May 19 of Addison's disease.

Dr. Caley Geoffrey Upchurch, Apex, aged 44, died May 31 of heart disease.

Dr. Joseph Conrad Watkins, Jr., Winston-Salem, died May 20 at a hospital in New York of mastoiditis.

Dr. Benjamin H. Henderson, Fayetteville, aged 63, died January 4 of sarcoma of the parotid gland.

Dr. John W. Jones, Winston-Salem, aged 64, died May 3 of motor paralysis following an infection from a tooth.

OKLAHOMA

Southeastern Medical Association has elected the following officers: Dr. T. H. McCarley, McAlester, President; Dr. Roy Cochran, Caddo, Vice-President; Dr. J. D. Haynie, Durant, Secretary-Treasurer.

Hobart Hospital formally opened its new building June 25. Dr. J. L. Adams, Pryor, is President and General Manager.

Muskogee opened its new City Hospital in June.

Dr. C. P. Murphy, United States Veterans' Hospital No. 90, Muskogee, has been transferred to Edward Hines, Jr., Hospital, Maywood, Illinois.

Dr. C. P. Bondurant and Miss Vera Cropper, Oklahoma City, were married June 23.

Deaths

Dr. M. Clay Wyatt, Bartlesville, aged 60, died June 29 after an illness of several days.

Dr. W. O. Clark, Durant, aged 74, died April 9 of pneumonia.

Dr. Joseph A. Deen, Ada, aged 50, died March 4 of pellagra.

(Continued on page 50)

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Sulphosalicylic Hexamethylenamine

Allays severe burning and has a soothing effect in kidney and bladder conditions without causing hematuria when taken for a long period of time. To clear shreds and pus in chronic and non-specific cases.

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Louisville, Kentucky

(Continued from page 48)

SOUTH CAROLINA

Deaths

Dr. Claudius Franklin Bullock, Nichols, aged 41, died in May of cerebral hemorrhage.

Dr. John H. Goodwin, Columbia, aged 58, died May 24.

Dr. MacW. Chambers, Spartanburg, aged 58, died May 21 of hypertension and cerebral hemorrhage.

TENNESSEE

Upper Cumberland Medical Society held its thirty-fourth annual session at Cookeville June 19-20. Dr. J. D. Quarles, Whitleyville, was elected President; Dr. Lewis Anderson, Gainesboro, Dr. L. M. Freeman, Granville, and Dr. R. M. Gaw, Gainesboro, Vice-Presidents; Dr. Z. L. Shipley, Cookeville, Secretary. The next meeting will be held at Red Boiling Springs.

The following changes have been made in the faculty of Vanderbilt University Medical School, Nashville: Dr. C. Sidney Burwell has been made Professor of Medicine and Physician-in-Chief of the Hospital; Dr. Hugh J. Morgan has been appointed a Professor of Clinical Medicine; Dr. Horton R. Casparis has been made Professor and Head of the Department of Pediatrics; Dr. John B. Youmans has been appointed to Associate Professor of Medicine; Dr. Tinsley R. Harrison, to Assistant Professor of Medicine; Dr. Beverly Douglas, to Associate Professor of Surgery; Dr. Robert E. Sullivan, to Assistant Professor of Ophthalmology and Otolaryngology; Dr. Christopher C. McClure, to Assistant Professor of Surgery in charge of Radiology, and Dr. William Litterer, to Assistant Professor in Preventive Medicine.

Chattanooga is to have a Medical Arts Building. It will be a ten-story building and will cost $450,000.

The President of Meharry Medical College, Dr. John J. Mullowney, has announced tentative plans for moving the School to a newly acquired site in the vicinity of Fiske University in Northwest Nashville. Meharry will not merge with Fiske University, but continue to maintain its own identity and have its own Board of Trustees. The change would permit an economical cooperation.

Dr. Robert Sebastian Cowles, Franklin, has been appointed Health Officer for Greene County.

Dr. William K. Sheddan, Columbia, recently celebrated his fiftieth year in the practice of medicine. Many of his associates and friends were present and a typical Southern dinner was served at home.

Deaths

Dr. George Washington Samuel, Nashville, aged 89, died May 13 of myocarditis.

TEXAS

Dallas Academy of Ophthalmology and Otolaryngology has elected Dr. John G. McLaurin, Dallas, President; Dr. J. S. Dimmitt, Sherman, Vice-President; Dr. W. M. Knowles, Secretary; Dr. L. M. Sellers, Treasurer.

The following officers were elected at a recent meeting of the Exchange Club, Dallas: Dr. William Deatherage, Treasurer; Dr. W. E. Loomis and Dr. O. M. Marchman as members of a Board of Control.

Ground has been broken for a new $75,000 hospital at Dalhart. Work will begin on this soon.

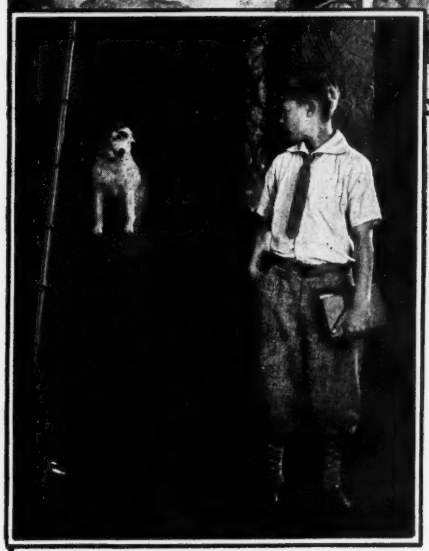
Formal opening and dedication of the New Women's Infirmary at the State Tuberculosis Sanatorium was held May 1. The new building was constructed at an approximate cost of $71,000. It provides facilities for treatment of fifty women with a waiting list of one hundred and fifty-eight.

The Jones Eye, Ear, Nose and Throat Hospital and Clinic, Dallas, was formally opened July 15. Drs. Wm. D. Jones and J. Guy Jones are the founders and active heads of the institution. A superintendent and several technicians are included on the staff. It is a two-story building and was completed at an approximate cost of $100,000.

Dr. J. Harvey Black, Dallas, was chosen President-Elect of the American Society of Clinical Pathologists at the annual meeting held in Minneapolis in June.

Dr. S. C. Terrell, El Paso, and Miss Oliva Wilson, El Paso, were married recently.

(Continued on page 52)



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. . . *and again the danger of Diphtheria*

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This season also brings with it another great educational responsibility which is ours. It is a task that involves thousands of little lives. It is that of spreading the story of diphtheria prevention among these children and their parents. With our present knowledge, neglect to immunize the public school population against diphtheria can be considered as nothing less than a serious dereliction of duty. The education of the parents is the one great need.

The development of the Schick Test and of Diphtheria Toxin Antitoxin Mixture has made possible the reduction of the incidence of diphtheria as an epidemic disease and the timely use of these important biologicals can even further reduce diphtheria mortality.

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(Continued from page 50)

Deaths

Dr. Ernest Victor Dickey, Dallas, aged 47, died June 22 of angina pectoris.

Dr. George S. Field, Gainesville, aged 84, died February 11 of paralysis.

Dr. John Duff Brown, Arlington, aged 71, died June 9 as the result of a cerebral hemorrhage.

Dr. Thomas C. Riveria, Dallas, died June 29. He was the third physician to register for practice in Dallas.

VIRGINIA

The fifty-ninth annual meeting of the Medical Society of Virginia will be held in Danville October 16-18.

Norfolk County Medical Society has elected Dr. James H. Culpepper, Norfolk, President; Dr. C. Lydon Harrell, Norfolk, Vice-President; Dr. Lockburn B. Scott, Secretary-Treasurer, re-elected.

A number of Richmond physicians have secured a charter to erect a hospital to be known as the Henry-Franklin Hospital. Dr. A. L. Herring is President of the corporation and Dr. T. B. Pearman, Secretary. Other officers are Dr. T. B. Weatherly, Dr. J. A. Rollings and Dr. Campbell Harris.

The South Boston (Virginia) Hospital, the private hospital of Dr. R. H. Fuller, is undergoing extensive improvements. Additions being made will more than double the present capacity for patients.

Dr. E. C. Levy, who reorganized the Health Department of Tampa and was in charge of the health work there for several years, has returned to Richmond.

Dr. John W. Cox, Alexandria, has been appointed a Field Representative of the American Society for the Control of Cancer, New York.

Dr. Edwin P. Lehman, Washington University, St. Louis, Missouri, has been elected Professor of Surgery and Gynecology at the University of Virginia, succeeding Dr. Stephen H. Watts, who has retired from active teaching. Dr. Sidney William Britton, Johns Hopkins University, Baltimore, will succeed Dr. Homer W. Smith as Professor of Physiology. Dr. Smith resigned to become Professor of Physiology at New York University.

Dr. R. Leo Seward, Isle of Wight, was recently elected a member of the Isle of Wight County School Board for a term of four years.

Dr. James K. Hall, Westbrook Sanatorium, Richmond, has been appointed Consultant Psychiatrist to the State Department of Public Welfare.

Dr. Fred J. Wampler has resigned as Director of the Accomac-Northampton Health Unit to become Professor of Preventive Medicine, Assistant Professor of Medicine and Director of the Out-Patient Department at the Medical College of Virginia.

Dr. D. Lane Elder and Dr. S. B. Perry have been elected members of the Hopewell City Council.

Dr. F. M. Brooks, Fairfax Station, has been elected a Trustee of a Fairfax County school for a term of four years.

Dr. William C. Holt, University, has gone to Dallas, Texas, where he will be connected with the Parkland Hospital.

Dr. Warren T. Vaughan, Richmond, was elected Secretary of the American Association for the Study of Allergy at the annual meeting of that Society held in Minneapolis recently.

(Continued on page 54)

CLASSIFIED ADVERTISEMENTS

PARTY WITH $3,000 to $5,000 can buy interest in modern tuberculosis sanatorium in Southwest. Details on application. Address C. L. T., care Southern Medical Journal.

FOR SALE—Electric Incubator, $16.00; Leitz-Microtome, 2 knives, $16.00; Micro-Colorimeter-Kutner, $8.00; Dark-Field Illuminator, $8.00; Electric Scales and Weights, $4.00; Kahn-Test, Other Materials. Low Price. Address, Box 917, Orlando, Florida.

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Rich in Calcreose . . . which provides the stimulant expectorant action of creosote and avoids gastric distress . . . this new Calcreose product furnishes a remedy for coughs and minor respiratory affections easy to take and quickly effective.

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Each litre contains 1.0326 gm. of di-sodium phosphate and the neutral salts of sodium and potassium chloride, and a total of 6.6648 gm. of the bicarbonates of calcium, magnesium, sodium and potassium.

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(Continued from page 52)

Dr. H. D. Scarney, formerly with the School of Ophthalmology of Harvard University and the Massachusetts Eye and Ear Infirmary, Boston, Massachusetts, is a member of the staff of the Gill Memorial Eye, Ear and Throat Hospital, Roanoke.

Dr. J. T. N. McCastor, formerly at Central State Hospital, Petersburg, has gone to New York, N. Y., where he is Assistant Physician and Graduate Interne for outside maternity work at the John Berwind Maternity Hospital.

Dr. George E. Wiley, Bristol, is the author of a new book of negro dialect stories which is entitled "Mixt Pickle."

Mr. Aubrey H. Straus, who recently resigned as Director of Laboratories for the State and City Health Departments, will open a private laboratory in Richmond.

Dr. Peter Boothe Pulman, Alexandria, and Miss Carolyn Burgess, Reva, were married June 23.

Dr. George Colbert Tyler, Newport News, and Miss Hilda Margaret Lankford, Morattico, were married June 20.

Dr. James Reginald Bailey, Keysville, and Miss Marguerite Stephenson, Littleton, were married June 23.

Dr. James M. Spencer and Miss Nellie Tickle, both of Roanoke, were married June 18.

Dr. Paul Ellis Prillaman, Richmond, and Miss Sally Doriot Haller, Aytheville, were married June 11.

Dr. George Wasko Surgent, Blue Ridge Sanatorium, and Miss Ida May Hicks, Crozet, were married June 16.

Dr. John Melvin Crymes, Lawrenceville, and Miss Ruth E. Staude, Richmond, were married June 6.

Dr. Edward Newton Pleasants, Richmond, and Miss Rose Lillian Fore, Pamplin, were married June 23.

Dr. Judson Tomkies Vaughan, Richmond, and Miss Alice Louise Gordon, Ashland, were married June 27.

Dr. Walter Reuben Gladding, Cape Charles, and Miss Dorothy Hardy Peple, Richmond, were married June 7.

(Continued on page 56)

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(Contiued from page 54)

Deaths

Dr. Henry Clay Carson, Osaka, aged 58, was killed by a railroad engine June 18.

Dr. Edgar B. Smoke, Winchester, aged 82, died June 10.

Dr. Charles C. Christian, Urbanna, aged 68, died June 7.

Dr. John R. Wheat, Richmond, aged 78, died June 4 of carcinoma of the sigmoid.

Dr. Presley Marion Rixey, Rear Admiral, U. S. Navy, retired, Rosslyn, aged 75, died June 17 of myocarditis.

WEST VIRGINIA

The Central Tri-State Medical Society will meet at Huntington September 20.

Ohio County Medical Society has elected Dr. A. L. Jones, President; Dr. J. G. Thoner, Vice-President; Dr. H. W. Bond, Secretary; Dr. Robert J. Armbrecht, Treasurer.

Plans are being made for the erection of a fifty-bed hospital for crippled children at Charleston by the members of the Beni-Kedem Temple, Nobles of the Mystic Shrine. The Shriners plan to erect the institution and then turn it over to the Imperial Council for maintenance. The building and equipment will cost approximately $350,000.

Dr. R. H. Paden, Parkersburg, has been appointed Director of the Division of Child Hygiene of the State Health Department.

Dr. William C. Camp, Spencer, was recently appointed Health Officer of Roane County.

Dr. Raymond Evan Bailey, Huntington, and Miss Ellen Seay, Richmond, Virginia, were married June 30.

Deaths

Dr. David Hott, Jr., Morgantown, aged 54, died May 20 at a hospital in Denver of pulmonary tuberculosis.

Dr. John Buckner Winfield, Clarksburg, aged 53, died June 5 at Washington, D. C., of chronic nephritis.

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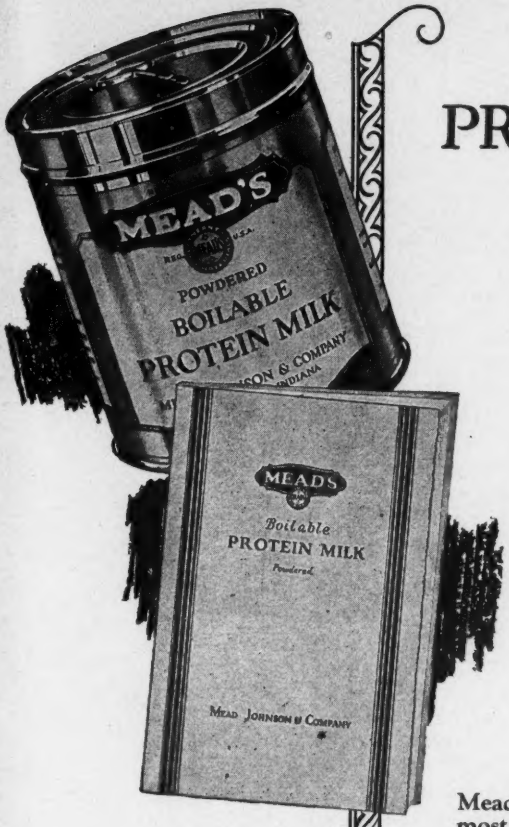

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